

10,000-Mile
Road Test:

HOW Good Is the Tempest?

POPULAR SCIENCE



FEBRUARY - 35¢ Monthly

First Turbine Fire Engine

PAGE 104

TURBINE
EXHAUST
STACK



EXTRA
DOUBLE-LENGTH
TRUE ADVENTURE

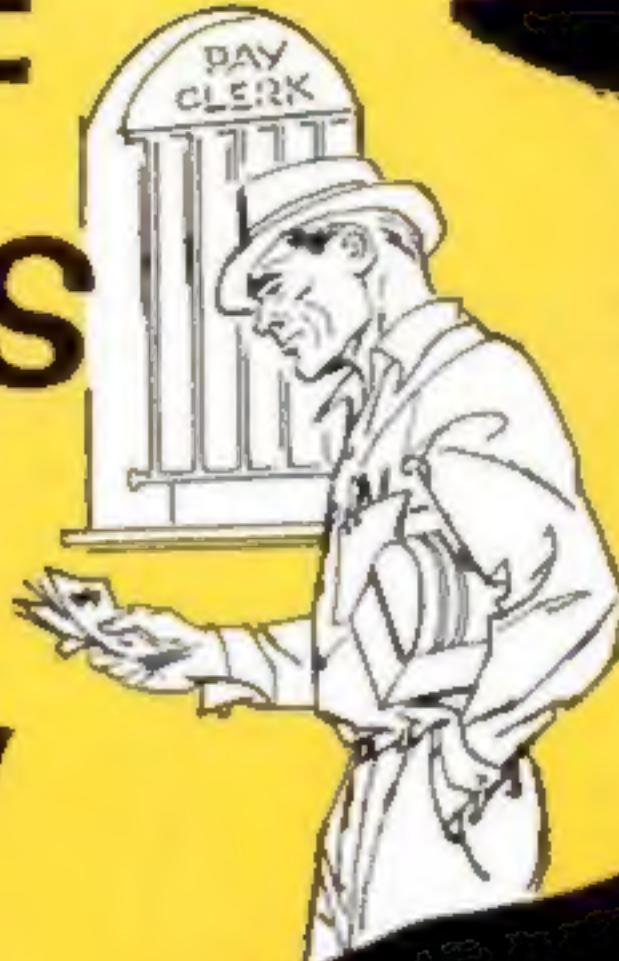
**The Violent End
of Flight 2511**

PAGE 243

BOATING SPECIAL

• Hank Bowman on What's Coming in Outboards
• New Hinged Aluminum Boat Folds Flat

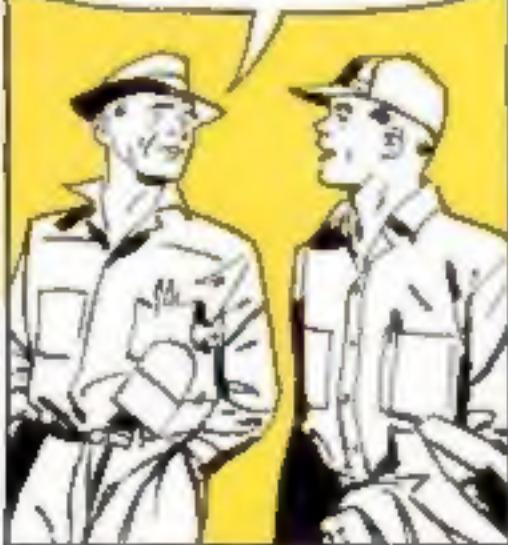
"I SAW MYSELF 10 YEARS FROM NOW!"



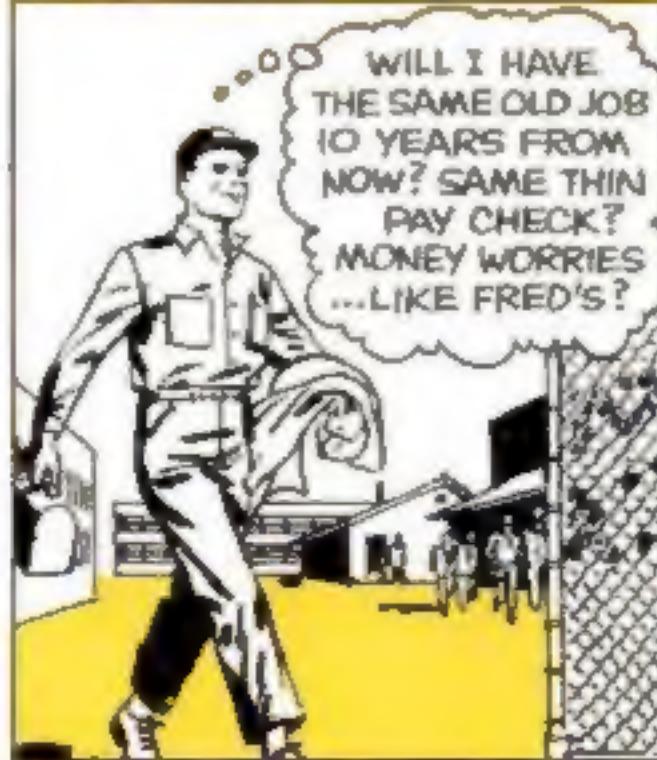
IT WAS PAYDAY. THERE WAS FRED, LOOKING A LITTLE RUN-DOWN. ON THE SAME JOB 10 YEARS. NICE GUY. MARRIED. TWO CHILDREN.

FRED AND I WALKED AWAY FROM THE PAY WINDOW TOGETHER. HE SEEMED DEPRESSED, UNHAPPY.

EACH WEEK I FEEL I'M LETTING THE KIDS DOWN. CAN'T SEEM TO AFFORD THINGS THEY NEED. I'M JUST NOT GETTING AHEAD.



FRED'S WORDS HIT ME ALL OF A SUDDEN. I COULD SEE MYSELF SAYING THE SAME THING—
10 YEARS FROM NOW!



THAT NIGHT, STILL THINKING ABOUT FRED, I SAW AN I.C.S. AD ABOUT HOW I.C.S. TRAINING OPENS JOB OPPORTUNITIES. HOW PEOPLE LIKE ME CAN WIN PROMOTIONS, MORE PAY.



I MAILED THE I.C.S. COUPON THAT NIGHT. MY BOSS SOON LEARNED I WAS AN I.C.S. STUDENT. HE MOVED ME OFF THE LINE, AND TWO RAISES LATER...

GEE, FRED, THESE I.C.S. COURSES ARE GREAT! YOU OUGHT TO SIGN UP, TOO!

WELL...MAYBE SOME DAY...

FRED'S STILL ON THE SAME OLD JOB, STILL HOPING FOR THE "BREAK" HE'LL NEVER GET WITHOUT TRAINING. ONE DAY THE BOSS CALLED ME IN...

YOU'RE BEING PROMOTED TO ASSISTANT SUPERVISOR, AND A GOOD RAISE GOES WITH THE JOB!

THANKS TO THOSE PRACTICAL I.C.S. COURSES!

FREE! I.C.S. CAREER KIT

**SEND COUPON
NOW...
GET ALL THREE
BOOKLETS**

- 1 "HOW TO SUCCEED," 32-PAGE BOOKLET OF CAREER TIPS
- 2 "CAREER CATALOG," OPPORTUNITIES IN YOUR JOB FIELD
- 3 SAMPLE LESSON (MATH) SHOWS I.C.S. METHOD



For Real Job Security—Get an I.C.S. Diploma! I.C.S., Scranton 15, Penna.

Accredited Member,
National Home Study Council

INTERNATIONAL CORRESPONDENCE SCHOOLS



BOX 8905B, SCRANTON 15, PENNA.

Without cost or obligation, send me "HOW TO SUCCEED" and the opportunity booklet about the field BEFORE which I have marked X (plus sample lesson):

- ARCHITECTURE and BUILDING CONSTRUCTION
- Air Conditioning
- Architecture
- Arch. Drawing and Designing
- Building Contractor
- Building Estimator
- Carpenter Builder
- Carpentry and Millwork
- Heating
- Painting Contractor
- Plumbing
- Reading Arch. Blueprints

- ART
- Commercial Art
- Magazine Illus.
- Sign Painting and Design'n
- Sketching and Painting

- AUTOMOTIVE
- Automobile
- Auto Body Rebuilding and Refinishing
- Auto Engine Tuners
- Auto Electrical Techniques
- Diesel Engines

- AVIATION
- Aero-Engineering Technology
- Aviation Engine Mach.
- Reading Aircraft Blueprints

- BUSINESS
- Accounting
- Advertising
- Bookkeeping and Cost Accounting
- Business Administration
- Business Management
- Clerk Typist
- Creative Salesmanship
- Managing a Small Business
- Professional Secretary
- Public Accounting
- Purchasing Agent
- Real Estate Salesmanship
- Salesmanship
- Salesmanship and Management
- Traffic Management

- CHEMICAL
- Analytical Chemistry
- Chemical Engineering
- Chem. Lab. Technician
- General Chemistry

(In Maxwell, reply P.O. Box 412, Minneapolis.)

(Partial list of courses)

- Oil Field Technology
- Pulp and Paper Making

- CIVIL ENGINEERING
- Civil Engineering
- Construction Engineering
- Survey Engineering
- Professional Engineer (Civil)
- Reading Blueprints
- Sanitary Engineer
- Sewage Plant Operator
- Structural Engineering
- Surveying and Mapping
- Water Works Operator

- DRAFTING
- Aircraft Drafting
- Architectural Drafting
- Drafting & Machine Design
- Electrical Drafting
- Electrical Engineer Drafting
- Industrial Pipe Drafting
- Mechanical Drafting
- Sheet Metal Drafting

- ELECTRICAL
- Electrical Appliance Servicing
- Electrical Engineering

- Electric Motor Repairs
- Gas-Elec. Techniques
- Gas-Light and Power
- Practical Electrician
- Professional Lineman
- Professional Engineer

- HIGH SCHOOL
- Good English
- High School Diploma
- High School General
- H. S. College Prep. (Eng'r's & Science)
- High School Math
- High School Science
- Short Story Writing

- LEADERSHIP
- Industrial Foremanship
- Industrial Supervision
- Personnel-Labor Relations
- Supervision

- MECHANICAL and SHOP
- Diesel Engines
- Gas-Elec. Welding
- Heating and Air Conditioning
- Industrial Engineering
- Industrial Instrumentation

- INDUSTRIAL SAFETY
- Machine Shop Practice
- Mechanical Engineering
- Plumbing and Heating
- Professional Engineer
- Quality Control
- Reading Shop Blueprints
- Refrigeration and Air Conditioning
- Tool Design
- Tool Making

- RADIO, TELEVISION
- General Electronics Tech.
- Industrial Electronics
- Practical Radio-TV Engr's
- Radio-TV Servicing
- TV Techniques

- RAILROAD
- General Railroad

- STEAM and DIESEL POWER
- Combustion Engineering
- Power Plant Engineer
- Stationary Diesel Engr.
- Stationary Steam Engines

- TEXTILE
- General

Name _____

Age _____

Home Address _____

City _____

State _____

Working Hours _____

A.M. to P.M. _____

Canadian residents send money to International Correspondence Schools, Montreal, Quebec, Canada. Special low monthly tuition rates to members of the U. S. Armed Forces.



Country cousin: It thrives on the rugged life. P. 67

Funny money: Are they unfair to do-it-yourselfers? P. 99

Mermaids: Anything can happen at this show. P. 94

Founded in 1872 Vol. 178 No. 2

Mechanics and Handicraft Reg. U. S. Pat. Off.

Popular Science

February, 1961

Cover photo by Ted Streshinski

CARS AND DRIVING

- Land Rover:** Who Needs a Road? 67
- This Car Refuses to Collide..... 84
- 10,000 Miles in a Tempest..... 86

DISCOVERIES AND INVENTIONS

- Bridge Travels at 55 M.P.H..... 72
- First Turbine Fire Engine..... 104
- So You've Invented Something... 122

SPECIAL FEATURES

- Zoo Doctor's Patients..... 78
- The Show Goes On—Under Water 94
- A Tough Way to Make Money.... 99

Double-Length Feature:
Violent End of Flight 2511.... 243

SCIENCE AND INDUSTRY

- O'Sullivan's Lead Balloon..... 74**
- Manned Buoy to Probe Depths... 112
- How a Differential Works..... 120

CONSUMER NEWS

- New Flameless Gas Furnaces..... 80
- What's New..... 116
- The Tool for Bending..... 188

PICTURE NEWS

- School for Fire Fighters..... 92
- Radar Has 9,000 Antennas..... 98
- They Crash-Test Rose Bushes.... 103
- A-Power Comes to the Arctic.... 110
- Giant Water Wheel for Niagara... 115

AUTO UPKEEP

- Gus's Trunkful of Trouble..... 36**
- Hints from the Model Garage.... 193

Editor HOWARD ALLAWAY

Assistant Managing Editors

Kendall W. Goodwin, Robert P. Stevenson

Senior Editors

Alden P. Armagnac, Devon Francis

Martin Mann, Everett H. Driner

Technical Editor

Hubert Luckett

Detroit Editor

Ken Fetmoyla

West Coast Editor

Wealey S. Griswold

Managing Editor FRANK ROWSOME Jr.

Associate Editors

Frank Darr, Sheldon M. Gallagher

Herbert O. Juhansen, Alfred W. Lees

Alex Markovich, Herbert R. Pfister

Jean Steens, Ruth Westphal

Editorial Assistants

Rosa Lee Beeland (Chief), Anna Dallas

Wanda H. Joseph, Georgette Sparks

Dorothy Zelica

Art Director HOWARD C. JENSEN

Art Editors

Herbert Anthony, Reginald A. Hawley

Harry Samuels

Art Associates

Eric A. Karmiński Jr.

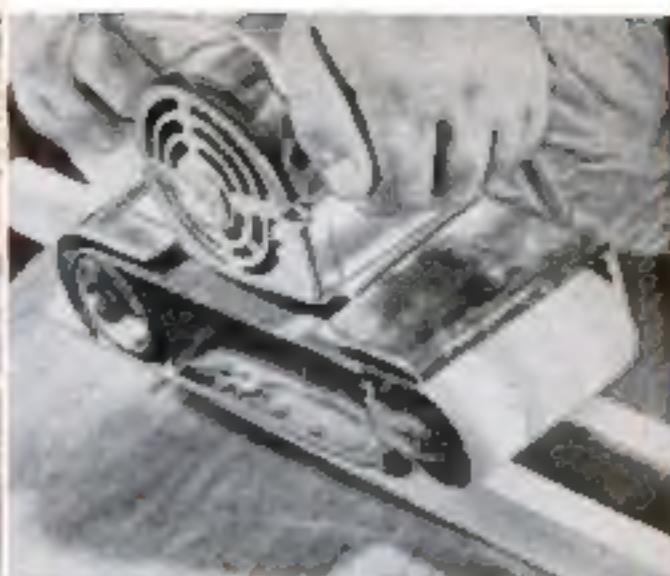
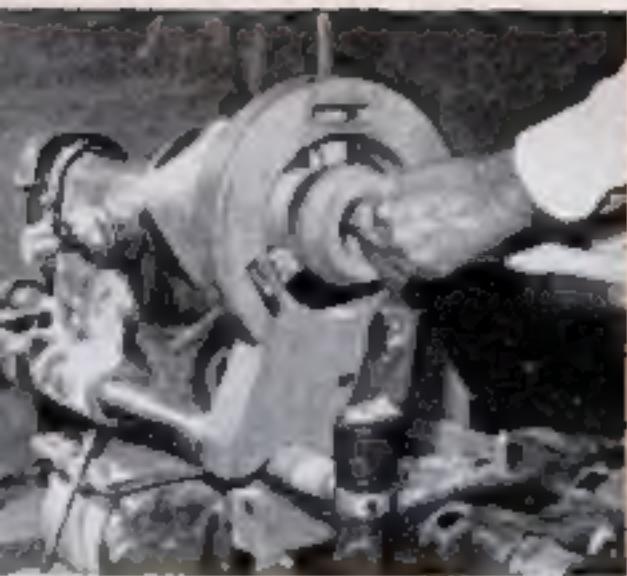
Henry W. Kazmirowski, Richard J. Meyer

Photography

W. W. Morris (Chief)

Robert D. Bond, Eugene Colangelo

EDITORIAL OFFICES: 355 Lexington Ave., New York 17, N. Y.



*Steady rest: Makes a hollow
in a vase a breeze. P. 162*

*Folding boat: Hinges let it
flatten like a flapjack. P. 133*

*Sanding: Smooth results—even
when you break the rules. P. 164*

Monthly.

America's
NEW-IDEA MAGAZINE
for 89 Years

SPECIAL BOATING SECTION

Coming in Outboard Motors.....	126
What's New Afloat.....	131
New Hinged Boat Folds Flat.....	133
Boat Buoyancy Comes in Cans....	139

FOR HOME AND SHOP

Steam Turbine for the Savannah.....	142
Gadgets for the Photographer....	148
Know-How File: Steam Heat.....	151
Easy Storage of PS Articles.....	156
Materials File: PST Tapes.....	157
Steady Rest for a Wood Lathe.....	162
Good Tricks for Power Sanding.....	164
Modern Lounge Chair for \$15....	169
It's a Son-of-a-Turkey.....	175
What Steel Is That?.....	177
Floating Candlelight.....	182
5 Projects for the Welder.....	184
New Twist on an Old Jig.....	190

SHORT CUTS AND TIPS

Box Saves Enlarger Adjustment....	147
Replacing Out-of-Reach Bulbs....	149
Tire Serves as a Spring.....	150
Hanger for Garden Hose.....	161
Shelf for a Typing Table.....	163
How to Weld Sheet Plastic.....	168
Breathers for the Furnace.....	174
Spring Clip Supplies Washer.....	176
Measuring in Tough Spots.....	181
Vise for Tying Flies.....	185
Handle Tames Ice Skates.....	187

EVERY MONTH

PS Readers Talk Back.....	6
PS Puzzlers.....	18
The Month in Science.....	23
Detroit Report.....	62
I'd Like to See Them Make.....	93
New Ideas from the Inventors....	107
Wordless Workshop	172

Publisher EUGENE S. DUFFIELD

Advertising Manager LEE P. ADAMS

Circulation Director EUGENE WATSON

ADVERTISING OFFICES:

NEW YORK—355 Lexington Ave.
CHICAGO—360 North Michigan Ave.
DETROIT—2810 Book Bldg.
SAN FRANCISCO—114 Sansome St.
CLEVELAND—636 B. F. Keith Bldg.
LOS ANGELES—711 South Vermont
PORTLAND, ORE.—520 S.W. Sixth Ave.

SUBSCRIPTION SERVICE:

Address all subscriptions and correspondence concerning them to: Popular Science

Subscription Department, 355 Lexington Ave., New York 17, N. Y. Allow four weeks' notice for change of address. Please give both old and new addresses, including zone numbers. Published monthly at 355 Lexington Ave., New York 17, N.Y., by Popular Science Publishing Co., Inc., Godfrey Hammond, Chairman of the Board; Eugene S. Duffield, President; Franklin E. Parker Jr., Secretary; Eugene Watson, Vice-President; Robert D. Beals, Treasurer and Business Manager. Second-class postage paid at New York, N. Y.,

and at additional mailing offices. Entered as second class matter at the Post Office Department, Canada. Printed in U.S.A. Copyright © 1961 by Popular Science Publishing Co., Inc. All rights reserved. Single copy 35¢. Subscriptions to United States, its possessions, and Canada, 1 year \$3.40 (2 years \$6.00, 3 years \$8.00). Elsewhere, 1 year \$6.00 (2 years \$11.00, 3 years \$16.00). Send notice of undelivered copies on Form 3579 to Popular Science Monthly, 355 Lexington Avenue, New York 17, N. Y.

ANNOUNCING!

ALL-NEW FIRESTONE

THE TRUCK TIRE THAT

NEW

flatter crown means equal pressure throughout tread print for extra load-hauling efficiency, extra mileage.

NEW

inner-rib bladed tread increases traction, lateral stability. Positive steering on curves—wet or dry!

NEW

"stone guards" built right into the tread keep it free of gravel and pebbles to increase truck tire life.



TRANSPORT-100, INCREASES MILEAGE 50% AND MORE

NEW

up to 30% deeper grooves, buttressed for strength; longer-lasting traction-tread on any wheel position.

NEW

efficient tread design: broad center rib equalizes load distribution, reduces slippage, increases mileage.

Proved in 100 million miles of fleet tests to bring you 50% more original-tread mileage and much greater drive-wheel traction than any other regular original equipment Firestone truck tire! The all-new, all-wheel position Transport-100 wears far longer—actually gives you faster starts and quicker stops when half-worn than other original equipment truck tires when new. And, it's the first truck tire anywhere truly noise-treated for quieter running. Yet it costs no more! In Nylon or Tyrex® rayon cord, tubeless or tubed. See it at your Firestone Dealer or Store!

©T. M. of Tyrex, Inc.

Built to give extra mileage on any wheel position and exceptional performance on drive wheels, this all-new Firestone Transport-100 gives you 50% more mileage before recapping. Made possible by (1) five years' research; (2) a new and phenomenally torque-toughened Firestone Rubber-X compound—runs more than 10° cooler; (3) 100 million total tire test miles including 3½ million miles of

"torture test" driving, the Transport-100's revolutionary new tread also increases traction beyond any previous truck tire. Even at its half-worn point, the Transport-100 still delivers more drive-wheel traction than other tires WHEN NEW. See the all-new Transport-100! It's the newest addition to the famous line of ever-tougher Firestone truck tires.

Copyright 1961, The Firestone Tire & Rubber Company

Firestone

BETTER RUBBER FROM START TO FINISH

Member of THE ATA FOUNDATION of THE AMERICAN TRUCKING INDUSTRY Time is Excellence to History every Friday evening, CBS Television Network

PS Readers



Hanger Saws and Hoo-Hoo Things

"THE Folk Toys We're All Forgetting" [Dec.] was delightful reminiscence. But I want to quarrel with the thesis that folk toys are a lost art. My theory is that these simple playthings are invented, forgotten, and reinvented as the raw materials for making them become more or less available.

How's a boy to make a wooden whistle these days? If he goes out to hack a branch off a willow, he'll be in trouble with tree-worshiping gardeners, if not with the cops. And wooden package handles are going the way of the wooden cigar box.

Yet Yankee ingenuity still flourishes. My own son invented some marvelously simple folk toys. One is the Hoo-Hoo Thing: the tubular cardboard core from a roll of toilet paper or kitchen towels. It makes an excellent megaphone, admirably suited to calling "Hoo-o-o-hoo-o-o" through.

Even better is his Hanger Saw. This is just the cardboard strip that pads the trouser bar of a wire coat hanger. Many of these strips have saw-tooth edges and make a most satisfying buzz when pulled across furniture legs (which are just standing there demanding to be sawed at by a four-year-old).

M. R. DWIGHT, Wellesley, Mass.

He's for Electric Heat

I WANT to tell you that you are right about electric heating ["No Flame, No Smoke, No Chimney," Nov.].

Four years ago, we built a new living room on the side of the house. We insulated it with two-inch fiber-glass with aluminum backing. We installed five baseboard heaters, or 2,500 watts. They do a beautiful job, even in subzero weather, heating that 29-by-12-foot room. The thermostat is set at 70, and when the

TALK BACK

weather gets cold enough for the heaters to operate, the light bill shows it. Last winter it stayed below 10 degrees about two weeks, with every night below zero, and our bill was \$72. It normally runs around \$35.

In a milder climate, electric heating would be my choice. It's quiet, clean, and service-free. The rest of my house has oil heat, and I wouldn't recommend that gummy, greasy stuff to anybody. For a cold climate you can't beat gas. I have it in my store.

CLARK F. CONAWAY, Knightstown, Ind.

Tips for Drivers

A COUPLE of years ago on an 8,000-mile auto trip, I discovered a new way to stay awake: chew bubble gum. This stuff chews harder than regular gum and the heavy chomping keeps you alert. I don't recommend it in place of regular sleep or rest periods, or for drivers pushing too long for safety. But it's a harmless and effective method for the driver



who has just had a big meal, the night worker driving home, or the driver who becomes drowsy riding alone.

E. N. WOLFE, Kansas City, Mo.

. . . I CARRY about 45 pounds of air in the spare tire instead of the 28 pounds called for when the tire is in use. Also I carry a length of hose with a fitting on each end. In this way I always have air on tap should any tire get low. It has turned out to be a happy thought several times while on the road or parked in a lot a good distance from a service station.

C. N. FINN, Little Rock, Ark.

. . . JUST read the Model Garage Hint on how to keep down corrosion on bat-

Are You "STANDING STILL" on your job?

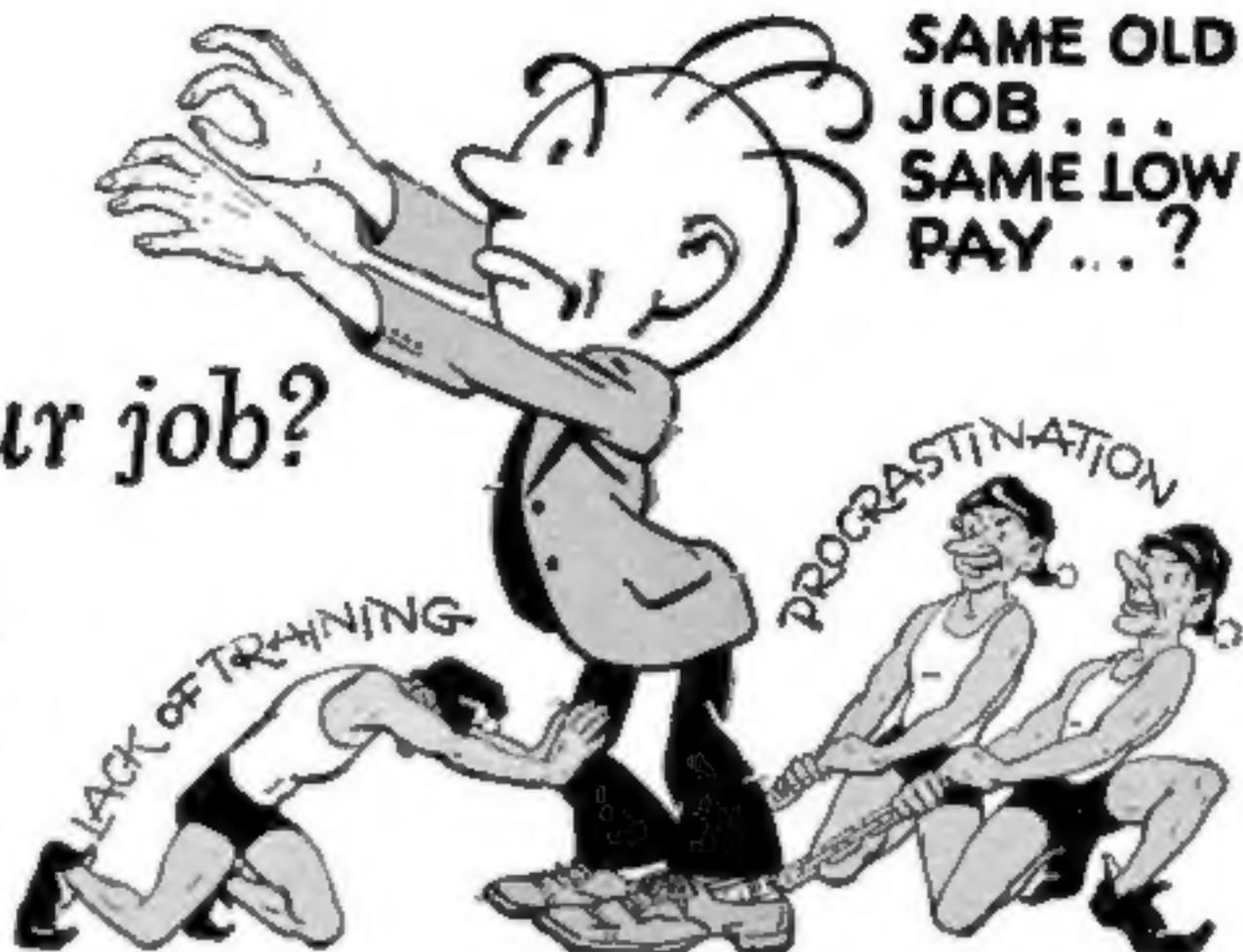
You can justify a real pay raise and a better position—by making one simple move—the move that opens the way to more earnings and promotions—*practical training*.

If YOU are "standing still" on your job—no promotions—only token increases in pay—then you had better do something about it. You know that if you are untrained, your chances of getting ahead are slim. **NOW IS THE TIME TO PREPARE.**

WILL RECOGNITION COME?

The only answer, as you know, is that success *will come* to the man or woman who is really *trained*. LaSalle has provided the "key to success" for many thousands of ambitious people who have sought our training for more than fifty years.

Get all the facts. Investigate the opportunities in your chosen field. It costs you nothing to learn about LaSalle's proven and tested accredited correspondence courses in the major fields of business as well as high school and technical courses. You can train in the



privacy of your own home, progressing at your own rate. You lose no time from work, and your instructors guide you every step along the way through our famous Practical Problem Method. Low cost—easy terms.

Don't let promotions pass you by—do something **TODAY** about your future.

The coupon below is for your convenience. Simply mark the program in which you are most interested, and mail at once. We'll send you, without obligation, free booklets describing that field together with the opportunities and what you must know to be a success.

ACCREDITED MEMBER, NATIONAL HOME STUDY COUNCIL

LaSalle Extension University, A Correspondence Institution, Dept. 283X, 417 S. Dearborn, Chicago 5, Ill.
Please send me, without cost or obligation, FREE catalog and full information on the field I have checked below:

ACCOUNTING

- Modern Bookkeeping
- Basic Accounting
- Practical Accounting
- Principles of Acctg.
- Cost Accounting
- Federal Income Tax
- Accounting Systems
- Business Law
- Auditing Procedure
- Controllership
- CPA Training
- Complete Accounting

TRAFFIC & TRANSPORTATION

- Organization & Mgt.
- Classifications, Rates & Tariffs
- Transportation Agency & Services

TRANSPORTATION LAW & REGULATION

- Rate Making & Rate Cases
- Complete Traffic & Transportation

LAW

- Law of Contracts
- Insurance Law
- Claim Adjusting Law
- Law for Trust Officers
- Business Law I
- Business Law II
- General Law
- First Year Law
- American Law and Procedure (LL.B. Degree)

BUSINESS MANAGEMENT

- Principles of Management
- Psychology in Business
- Selling & Sales Management
- Advertising & Marketing
- Production Problems
- Business Financing
- Credit & Collections
- Office Management
- Managing Men
- Accounting & Statistical Control
- Business Correspondence
- Organization & Reorganization
- Legal Problems
- Complete Business Management

MANAGEMENT COURSES

- Basic Management
- Production Management
- Sales Management
- Advertising & Sales Promotion
- Financial Management
- Personnel Management
- Sales & Executive Trng.
- LaSalle Sales Training
- Foremanship Training

HIGH SCHOOL

- High School Preparatory
- General Business Course
- High School Diploma
- Commercial Course
- Secretarial Course

**SAME OLD
JOB...
SAME LOW
PAY...?**

PROCRASTINATION

Name..... Age.....

Address.....

City, Zone, State.....

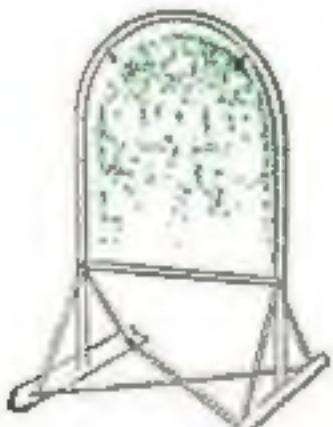
**CHECK THIS COUPON AND MAIL
TODAY...SURE!**



*For any car on any road
the world's best engine
life preserver is*

Quaker State Motor Oil

Keep your car on the road, out of the repair shop. Insist on Quaker State Motor Oil, super-refined from 100% Pennsylvania Grade Crude Oil, for complete engine protection. *For the name of your nearest dealer, call Western Union by number and ask for Operator 25.*



Quaker State Oil Refining Corp., Oil City, Pa.

tery terminals [Dec.], but I still like my way best:

I cut two felt washers from an old felt hat and put one on each of the posts under the clamp. The washers should be at least 2" in diameter to allow for cutting the hole in the center. When the car is serviced, I put a few drops of oil on each of the pads and there is never any corrosion on the terminals. The battery man that told me of this showed me the clamps on his Nash car and told me they were the original ones—16 years old. I have done this for a number of years and never have had to put new clamps on the cables.

ALBERT B. JOHNSON, Marysville, Kan.

Are Smoke Screens Old Hat?

THE smoke-screened getaway car rigged by that jewel thief the FBI caught ["Picture News," Dec., p. 103] is a rarity now, but used to be standard equipment for bootleggers in the Twenties.

Today moonshine transporters consider smoke unsporting—it might cause the pursuing revenooers to lose control. And hurting cops is bad for business.

A. L. CAPE, Marietta, Ga.

Fun and Games for a Living

THE customers in my electric-appliance repair shop certainly keep life from getting dull. Recently, an elderly lady made my day.

She popped in with an equally elderly electric iron that blew a fuse every time



she tried to use it. After testing her iron, I informed her that it was badly short-circuited. She puzzled over this for a while, then asked timidly: "Can you lengthen it while I wait?"

CARNEY CHESS, N. Hollywood, Calif.

Shades of Annie Oakley

MY WIFE brought an old-fashioned earthenware cookie jar out to my shop and asked me if I could bore a hole in its bottom so she could use it for a flowerpot. I have bored lots of holes in concrete and masonry with a masonry drill, but never one in the bottom of an

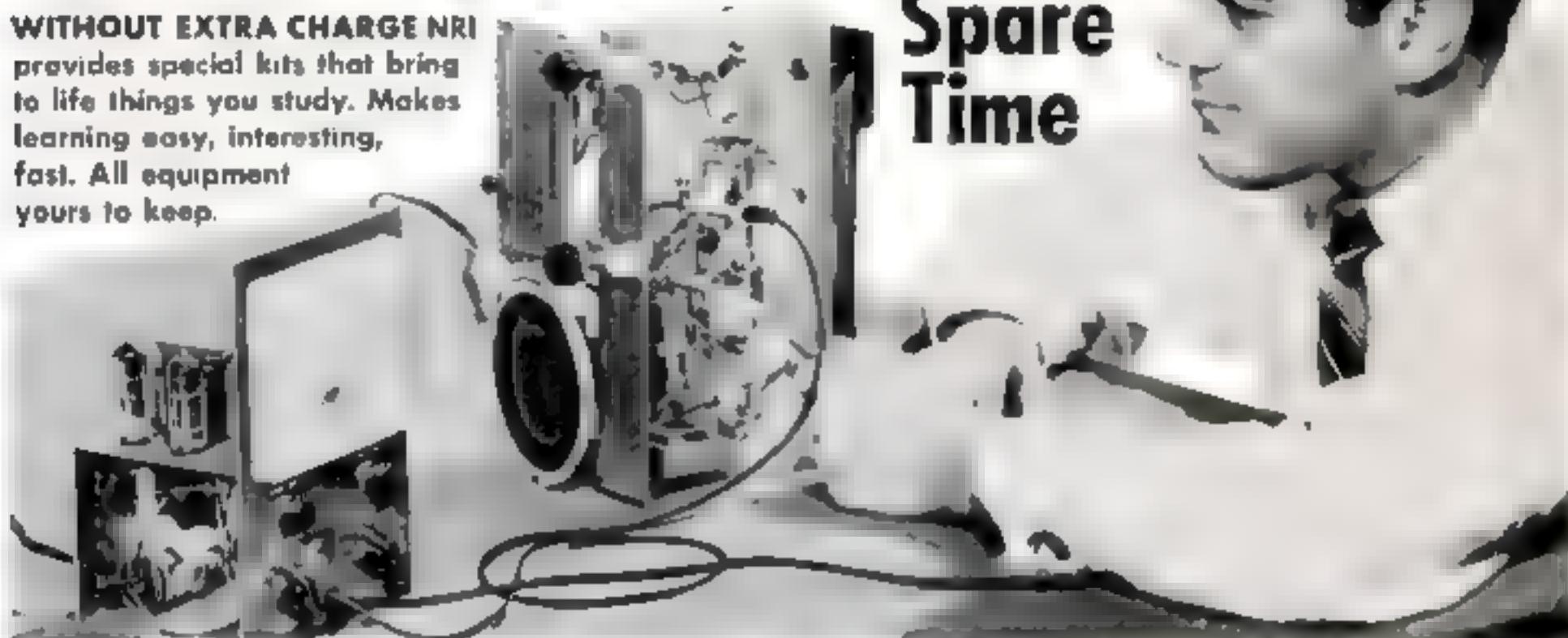
Learn Radio-Television Electronics

by Practicing at Home in Your Spare Time

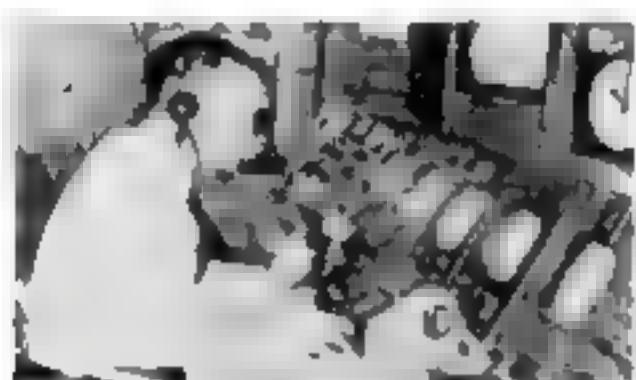
WITHOUT EXTRA CHARGE NRI

provides special kits that bring to life things you study. Makes learning easy, interesting, fast. All equipment yours to keep.

Spare
Time



Fast Growth Offers You High Pay, Prestige, Bright Future



From Radio-TV Servicing and Broadcasting to missile launching sites like Cape Canaveral, NRI graduates share in the gigantic Electronics industry. Interesting jobs await you in studios, on ships and planes, in your own business. Mail coupon today for NRI catalog.



Many NRI graduates help build, install, operate and service automated electronic equipment for the new "Space Age" we live in—equipment used in offices, factories, the military. Others have important jobs as inspectors, laboratory technicians, etc., or hold essential civilian posts with the Government and Armed Forces.



A. M. SMITH
President
I am sure of men like yourself, most of whom without college or technical diplomas, have moved up to good pay and enjoy greater prestige in jobs in TV and Radio broadcasting stations, in industrial plants, making Electronic equipment or in businesses of their own where they sell, install and service radios and TV sets.

Train With The Leader

Join the many NRI graduates now taking advantage of career opportunities in the amazing Electronic Age. For 4 years NRI has featured the best Radio-TV Electronics training for beginners, for men without previous experience. Throughout the U.S. and Canada, successful NRI graduates are proof that it's practical to train at home, in your spare time, at your own pace. Keep your present job while training. NRI supplies this training at low cost because it is

NRI Trained These Men

I was working in a textile factory trying to make ends meet. Now I own one of the most modern service shops in the nation. ARTHUR C. TAYLOR, Glasgow, Ky.

After graduating I was a shipboard radio operator. Now I am chief engineer at Station WARA. NRI was a wonderful foundation. RAYMOND D. ARNOLD, Attleboro, Mass.

Thanks to NRI I am in a top position with the Federal Aviation Agency in the Navajo Electronic Section. JOE DUCKWORTH, Fort Worth, Texas. Four months after starting your course I left my job in a hardware store to work at Raytheon Manufacturing. Now I am an engineering assistant in Microwave Power Tube Research and Development Laboratory. LEONARD BLOOM, Newton Centre, Mass.

the oldest and largest home-study Radio-TV Electronics school. In every respect you will find the Electronics field a profitable one for the ambitious man. And by NRI learn by doing method in the most practical way for you to get into this exciting field quickly.

Start Soon to Earn More

NRI training can bring prompt financial return. Soon after enrolling, NRI shows you how to earn \$10, \$15 and more a week extra for your spare time. This can lead to a profitable Radio-TV business of your own. Others have found good paying jobs within a year after enrolling.

Mail the coupon below TODAY for our FREE CATALOG. It tells in words and pictures about the amazing field of Electronics. Read success stories. See the equipment you get. Find out about the NRI 60-day free trial enrollment offer and convenient monthly terms. National Radio Institute, Washington 16, D.C.

GET 64 PAGE CATALOG

FREE

MAIL THIS COUPON NOW!

National Radio Institute

Washington 16, D.C. 100

Please send me full information without cost or obligation. No representative will call. (Please print.)

Name: _____ Age: _____

Address: _____

City: _____ State: _____ Zip: _____

Additional space provided inside order coupon.

EARNING MONEY?



Do you need more income for home — car — vacation, fun?

Right now the Accident Investigation and Adjusting Field offers men 18 to 60 tremendous opportunities. Here's why: This vital business distributes more money than any other service industry. Last year alone over 200 MILLION ACCIDENTS had to be investigated for Insurance Companies, Airlines, Railroads, Steamship Lines, and Government Offices. The number of such losses is growing—and the need for trained men is booming.

INVESTIGATE



FIRE LOSSES



AUTO ACCIDENTS

You can investigate full time for one company—or earn \$3 to \$10 an hour in your own business. A. J. Allen earned over \$2,000 in ten weeks. Gary Williams doubled his former salary in four months. NO prior experience or higher education needed. And age is no barrier. Here is a field wide open to men 18 to 60.

Let us show you how Universal Schools has trained hundreds of men in their own homes in spare time—and then helped them add thousands of dollars to their incomes. Send TODAY for FREE Book. No salesman will call. Write at once to me.

M. O. Wilson, Universal Schools
Dept. PS-2 6801 Hillcrest, Dallas 5, Texas

old cookie jar. Well, sir, I surprised myself.

I didn't have a drill in the shop, masonry or high speed, that would make more than a small indentation in the blasted jar; but I wasn't about to give up even if my experimentations broke it in a thousand pieces. Here's what I did:

I packed the jar with damp sand, level with the top, turned the jar upside down, aimed my .22-cal. rifle at the middle of



the bottom of the jar, and pulled the trigger. Result: a dandy hole.

PHILIP J. SHULER, Acton, Calif.

Pity the Poor Proofreader

AFTER reading your December Puzzlers, I have a puzzler for you: That plum bob you mentioned [p. 45]—is that what you set up at a Halloween party when you run out of apples?

BOB SYLVESTER, St. Paul, Minn.

Only a few thousand copies of the magazine spelled plumb bob without the familiar b at the end. Before the printing run was well started, an alert editor spotted the missing letter. Nevertheless, plumb bob or plum bob, it means the same thing and you'll find both spellings in Webster's New International (Unabridged) Dictionary.

Cider Press Ferments Words

IT SEEMS to me that the hard-cider maker pictured in November ["The Rig to Make Hard Cider"] is a little mixed on arithmetic and pounds per square inch. He says to suit the press for the jack you'll use, and aim for a rig that will put about 150 p.s.i. on the press rack.

The drawings show a press rack having an area of about 80 square inches. Under the pressure recommended, this would require the jack to develop a thrust of 12,000 pounds (six tons).

The picture shows a conventional bumper jack in use. These usually have a rated capacity of 2,500 to 3,000 pounds, or 1½ to 1½ tons, which is probably a generous rating.

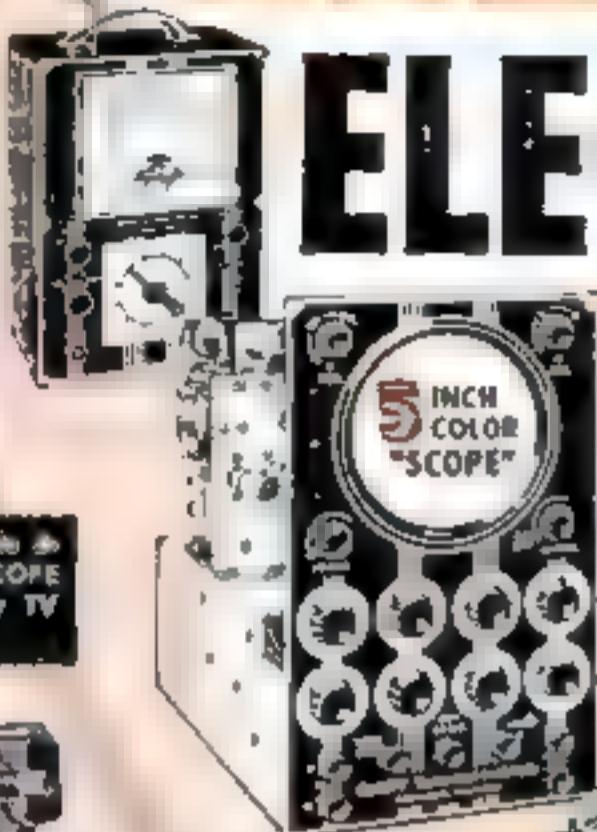


You build and keep this valuable electronic "Tool—
VOLTMETER"

You build and keep this 5-inch
COLOR OSCILLOSCOPE—almost a "must" for TV
servicing.

**COLOR
TV**
DeVry Tech's
program also
includes training
in Color Television

To obtain complete information, mail coupon today.



... make important points crystal clear. Speeds your learning. It's almost like having an instructor at your side!

If you are subject to military service, the information we have should prove very helpful. Mail coupon today.

Get Your GUIDE

TV-Radio Broadcast Technician
Color Television Specialist
Radar Operator • Laboratory Technician
Airline Radio Man • Computer Specialist
Quality Control Manager
Your Own Sales & Service Shop

YOU GET THE SAME **EMPLOYMENT SERVICE**

that has helped thousands of our graduates toward fine careers in Electronics.



Accredited Member of National Home Study Council

"One of North America's
Foremost Electronics
Training Centers"



DeVRY TECHNICAL INSTITUTE
CHICAGO 41, ILLINOIS



You work over
300
Inventive-Design
Projects

Build over 300 practical projects from many thousands of Radio-Electronics parts. You build and operate TV-Radio circuits ... wireless microphones ... and many other major projects—all designed to provide continuing practical experience at home.

DAVRY TECHNICAL INSTITUTE	
4141 Belmont Ave., Chicago 41, Ill. Dept. PS-2 R	
Please give me your FREE booklet, "Electronics in Space Travel,"	
and tell me how I may prepare to enter one or more branches	
of Electronics.	
Name _____	Age _____
Street _____	Age _____
City _____	Zone _____ State _____
Canadian residents address: DeVry Tech of Canada, Ltd. 170 Lawrence Avenue West, Toronto, Ontario	

the NEWEST BIG HP MOTOR for 1961 . . .

TigerShark™ 800™

DEPENDABILITY • POWER • PERFORMANCE



When you want both skiing speed and cruiser pushing power, put a new 80 HP Tiger Shark on the transom. With exclusive "Power Spread," its power curve starts high, stays high. West Bend's new 4-in line engine winds up to its rated HP within a dock length—at 4750 RPM lifts your boat into a clean, fast plane, never falters under a load.

And you can forget battery problems. New Constant Current "CC" Alternator-Generator delivers a regulated 20 amps—even while idling!

Famous race driver, Jim Rathmann, says, "I like the dependable 'home-stretch' power that's there when I need it."

Every West Bend motor carries an unqualified guarantee on parts and labor for one full year. See your West Bend dealer now. He'll show you the most dependable, most advanced outboard motors today—widest HP range, complete line from 2 through 80 HP.

Men Who Depend on Motors Recommend

— Stark Outboard Motors

West Bend Aluminum Co., Outboard Motor Division,
Hartford, Wisconsin
West Bend Aluminum Co. (Canada) Ltd., Barrie, Ont.



FREE! Please send me the West Bend Sharks catalog for 1961

NAME _____

ADDRESS _____

CITY _____ ZONE _____ STATE _____

DEPT. PS

He doesn't seem to be exerting himself very much, yet he'd have to, to produce even 6,000 pounds pressure. Does his phenomenal power come from exuberance developed by liberal draughts of his high-power cider, or did he arrive at the 150 p.s.i. figure while in a foggy mood induced in a similar way? Whichever way it came about, it gives support to his statement, and conclusion, that stuff like that is illegal.

ELWOOD J. WAY, Washington, D.C.

The author, E. F. Lindsley, replies: "The letter from Mr. Way only goes to show that the inner secrets of what is essentially an 'art' should never be revealed to a certain type of mind. I suspect, from his address, that he works for the alcohol-tax people and I'm inclined to take the fifth (amendment, that is).

"For the record, the press rack is made of 10 strips of one-by-ten, five of which make up slightly less than 50 square inches on which we compute unit loading. At 150 p.s.i., which we are 'aiming' at, and I use the term loosely, we would need only 7,500 pounds.

"Bumper jacks are rated for safety. Here, this is no concern and I hang and bounce on the jack handle far harder than I've ever done when hoisting a car. I may not hit 150 p.s.i., but let E. J. Way prove I don't come close to it on the unit loading of the rack slats. What's more, if he's one of those government fellows, he'd better keep away from our pressing parties in these parts."

. . . MAY we have permission to reproduce the article on the cider-making rig? We'd like to distribute it to a few of our



apple customers. Several have already purchased all the copies on the newsstands here and we'd like to supply about 50 more who are interested.

E. C. CLAPPER, Cut Bank, Mont.

Why sure. Looks like the folks in Cut Bank are going to have a Big Time.

REPAIR ELECTRIC APPLIANCES!

Save on repair bills . . . earn in spare time!



This 370-page Rinehart ELECTRICAL APPLIANCE REPAIR MANUAL shows you how to do the toughest repair jobs as well as the easy ones—even if you've never fixed an appliance before! Gives clear how-to-do-it instructions on every modern appliance—irons, toasters, ranges, cleaners, mixers, washers, iron-

ers, clocks, razors and all the rest. Handy charts help you locate troubles fast. Simple homemade test tools are described. Gives you the "know how" you need to fix your own appliances—or to build a profitable full or part time repair business. Price only \$6.25 . . . see money-saving offer in coupon.

LEARN OIL BURNER REPAIR!

Solve oil heat problems of all kinds!

Save real money by repairing, adjusting or even redesigning your own oil burner installation. Earn good pay by doing this work for others!

This new, 400-page manual, DOMESTIC OIL BURNERS AND OIL HEAT with its more than 300 pictures and diagrams, trains you for fast, accurate service on all types in common use.

Teaches you all about puzzling oil burner controls. Shows how to make heat loss surveys and design economical heating systems. Includes details on firing rates, chimneys & drafts, piping, wiring; etc. Duo-Spiral binding puts BOTH pictures and related text side by side for easy use on the job. Price \$8.75—or see money-saving offer in coupon.

REPAIR ELECTRIC MOTORS!

It pays to train for something different

The electric motor is the "heart" of all electrified appliances and machinery—and this famous ELECTRIC MOTOR REPAIR manual is a complete training guide to help you cash in on this fast-growing repair field. Shows step by step how to handle all repair jobs (including complete rewinding) on practically any

AC or DC motor or generator, small or large. Includes motor controls. 360 pages and over 900 how-to-do-it pictures. Handy Duo-Spiral binding. When a specific motor comes in for repairs just look it up. Pictures and text tell what to do—exactly how to do it! Price \$9.25—or see money-saving offer.

New! Master Guide to TELEVISION REPAIR!

Helps you locate TV troubles fast . . . and fix 'em right!

This remarkable new 302-page HANDBOOK OF TV TROUBLES helps you track down and repair practically any television trouble in less time with less effort. Just look up the trouble symptoms exhibited by the TV receiver itself: no sound or raster, screen intermittently dark; abnormal

contrast in spots; "snow"; poor detail; sync, brightness, size, centering, or sound troubles and all the rest. Step by step the Handbook guides you quickly to the seat of the trouble—then shows you how to fix it. Eliminates guesswork and needless testing. Easy to follow. Over 150 illustrations. Price \$7.50.

Train for the ELECTRONIC FUTURE...NOW!

Complete, basic training for beginners . . . at rock-bottom cost

Practically everything in the electrical, electronic, radio, television or communications field is based on the same fundamental electrical principles—and this big, 396-page BASIC ELECTRONICS Manual explains them all so you can really understand them. Even includes a 60-page INTRODUCTION TO ELECTRONICS. Over 300 illustrations help explain basic principles, their

uses, their problems and solutions. Covers Currents, Circuits; Electromagnetism; Phase Relations; Instruments and Measurements; Power Factors; Motors; Generators; Controls; Batteries; Tubes; Transistors; Amplifiers; Sound Reproduction and dozens of related subjects. Price only \$6.25. Sold on Money-Back guarantee!

— — — PRACTICE 10 DAYS FREE! — — —

Dept. PS-21, Technical Div.,
HOLT, RINEHART and WINSTON, Inc.,
283 Madison Ave., New York 17, N. Y.

Send books checked for NO-RISK EXAMINATION. In 10 days, I will send price indicated plus postage or return books and owe nothing. **SAVE!** Send cash with order and we pay postage—same 10 day return privilege.

<input type="checkbox"/> Electrical Appliance Service Manual . . .	\$6.25
<input type="checkbox"/> Domestic Oil Burners & Oil Heat . . .	\$8.75
<input type="checkbox"/> Electric Motor Repair . . .	\$9.25
<input type="checkbox"/> Handbook of TV Troubles . . .	\$7.50
<input type="checkbox"/> Basic Electricity (Incl. introduction to Electronics) . . .	\$6.25

NAME . . .

ADDRESS . . .

CITY, ZONE, STATE . . .

Check here to order Electric Motor Repair; Electrical Appliance Service Manual, and Domestic Oil Burners at only \$22.00 plus postage for ALL THREE big books. (Regular price \$24.25 . . . you save \$2.25!) **OUTSIDE U.S.A.** Add 50¢ to price of each book. Cash only. 10 day return privilege with money refunded.

RUGGED RELIABILITY TEST: NEW TEMPEST DRIVEN ROUGH AND HARD BY TEAM OF TEENAGERS!



Six of the teenagers photographed at a rest stop in Denver, Colorado. Left to right: Roger Anthony, John Sheffler, Jay Hall, Larry Weber, Jim Bader and Bob Quaid.

THE HOT TOPIC IS THE NEW **TEMPEST** BY PONTIAC!



When you turn a couple of new cars over to a team of teenagers, you know the cars will get a real test of performance and durability. That's exactly what Pontiac did last July 1 with a Tempest Sedan and a Tempest Safari! The only instructions: "Keep them moving 24 hours a day. Treat them rough! Pile on the miles! Drive safely. Stick to the traffic laws."

The Tempest had already passed all the usual car tests (2,600,000 miles of testing by pro drivers and engineers). But this was the big one. A new and different kind of test. Pass this and the Tempest had it made.

It was a responsible assignment. The kids knew it and they bought it—100%! Sure they got tough with the cars. But that's what Pontiac expected—and wanted! That's the way you find out how much a car can take . . . how much it can deliver.

PONTIAC RELIABILITY PROGRAM PAYS OFF!

The test ended on October 15, 1960. The durability run proved conclusively that the new Tempest (with the 4-cylinder engine up front . . . transmission in the rear . . . flexible, triple-alloy steel drive shaft . . . 4-wheel independent suspension . . . integral body and frame) gives the others something to shoot for on performance, economy and reliability.

THROUGH 48 STATES, CANADA, TOO!

Supervised by three Pontiac engineers, these teenagers really man-handled the Tempest through 48 states and 7 Canadian provinces. They rammed the cars over back roads! Held it at the legal limit on expressways! Breezed it up and down Pike's Peak with no sweat! Scooted across scorching deserts.

EQUAL TO SEVEN YEARS OF DRIVING

Day and night the miles piled up. 100,947 on the Sedan; 101,002 on the Wagon. Roughly the same as 7 or 8 years' driving. The cars got no special care. The protective maintenance procedures recommended in the Owner's Manual were followed—and it paid off! Plugs, points and fuel filters were changed every 12 to 15 thousand miles. Brakes were adjusted a couple of times but never needed retuning! Tires were changed twice.

(Here are the other repairs. Sedan: 19,194 miles—starter solenoid changed. 20,701 miles—windshield cracked by stone. 40,094—left rear back-up light replaced. 62,765 miles—fuel pump replaced. 96,492—generator brushes replaced. 98,549—radiator leak repaired. Wagon: 4,576—light switch replaced. 16,192—stone chip in windshield. 40,591—heater switch connector loose. 51,368 miles—flying rock pierced gas tank. 96,527—generator brushes replaced. 97,210—rear wheel bearing replaced.)

That's it! And that's low-cost, trouble-free driving. Check the Tempest out yourself! See your Pontiac dealer. Get the keys. Drive it.



TEMPEST SAFARI RACKED UP
101,002 TOUGH MILES!
IN 107 DAY ROUND-THE-CLOCK MARATHON



TEMPEST SEDAN POUNDED
100,947 RUGGED MILES!
FROM COAST TO COAST, BORDER TO BORDER



Learn at Home in your spare time to Fix Electric Appliances



Better Pay—More Opportunities

Get into a field where there is important work and opportunity for the trained man. Millions of electric appliances are sold every year. Every wired home now has an average of 8. Many of them need service and repair. Owners pay well to have them fixed quickly properly. This is your opportunity for a better job, your own part-time or full-time business. NRI can give you the training you need at home, in your spare time.

Spare Time Earnings Start Soon

Soon after starting you will be able to earn extra cash fixing toasters, clocks, fans, vacuum cleaners, etc., for neighbors and friends. Keep your job while learning and earning. Put spare time to work for you. Work in your basement, garage, spare room. You'll be amazed how easily you too, can start earning many extra dollars. NRI shows you how. Even before you finish training your spare time earnings may pay for the course and equipment.

NRI Sends Tester to Learn and Earn

You need proper equipment to service today's automatic appliances. With this course you get parts to build professional type, dual-use Appliance Tester. You learn . . . it takes guess work out of servicing. Mail coupon for FREE book and Sample Lesson. See how easy it is to learn. Find out about NRI—a school that for more than 40 years has been training men through home study for success. Good pay jobs. Our reputation record, experience back up this course. Write now to: National Radio Institute Dept. BB1, Washington 14, D. C.



FREE Lesson and Book
Mail this NOW!

NATIONAL RADIO INSTITUTE

Dept. BB1, Washington 14, D.C.

Send me Lesson and Book Free. No Salesman will call.

Name Age

Address

City Zone State

ACCREDITED MEMBER NATIONAL HOME STUDY COUNCIL

C-18

Beauty by Colorcrete Can Earn High Incomes



Beautifying buildings by Colorcrete is a business opportunity awaiting men of modest capital everywhere. Owners of homes, stores, motels, schools—almost any type of construction—are looking for means to give lifetime eye-appeal to drab or dirty concrete, stucco and similar masonry surfaces. Colorcretors can do such jobs, in little time and at little cost, and pocket generous profits. Colorcrete is a cementitious material, applied by air pressure. Tough, tenacious, enduring, 30 colors. Investigate this low-investment enterprise by writing for the Opportunity Book.

COLORCRETE INDUSTRIES, INC.
572 Ottawa Ave., Holland, Mich.

COLORCRETE

SHIRT POCKET TRANSISTOR RADIO!



BUILT-IN FERRITE ANTENNA TINY 1 1/2" SPEAKER!
WORLD'S SMALLEST PORTABLE RADIOS!
BIGGER THAN A PACK OF CIGAR
ROTTLES! Use two double reflected TRANS-
ISTORS! Guaranteed to receive local sta-
tions anywhere. Uses standard 9V
battery. AMERICAN MADE AND
SERVICED GUARANTEED FOR ONE YEAR!
SEND ONLY \$3.00 (cash ok, mail and pay postage
only \$1.00 plus 10% postage on arrival or
send \$5.00 for express delivery. Send complete
ready to play. Available only by mail from
Midway Co., Dept. TPS-2, Kearney, Nebraska

WALKIE TALKIE RADIO SENDING SET



YOUR OWN POCKET SIZE RADIO STATION
Talk to any house or car radio without hookups
of any kind. No R.F. antenna. Break in on regular
radio frequencies. Works in cars, boats and planes.
Talk with self-contained flashlight battery and
Power Transistor! Talk to radios in the same
building and to cars or between cars up to one
block or more away depending on local band type.
No license or permit needed! Practice and
read for a million ways. Guaranteed to work
1 year service guaranteed!
SEND ONLY \$3.00 (cash ok, mail and pay
postage only \$1.00 plus 10% postage on arrival or
send \$5.00 for express delivery. Complete
ready to operate with the facts in New T-81
Model Radio Talkie to new Super-powered! Order
now now! Today! Available only from
WESTERN RADIO, Dept. TPS-2, Kearney, Neb.

ELECTRIC WELD - BRAZE & CUT

REPAIR MOST EVERYTHING MADE OF METAL

Home and Auto Repairs, Farm Equipment, Ranch
and Farm Equipment, Metal
and Steel Work, Gates,
Windows, etc. Weld and straighten, with
certified heat from matte torch,
Cut and weld up to 1/2
steel plate. A million uses
for Home, auto farm, in-
tentate factories, etc.
Works from any home 110
volt plug-in. Complete with arcs welder's mask, arc torch, supply of
carbon welding and brazing rods and complete Welding Instruction
book. 1 year guarantee!
Send only \$3.00 (cash ok, mail and pay postage \$1.00 plus COD
postage on arrival or send \$1.00 and we will send
postpaid. Item gift. Order now for early delivery. Available only from
MIDWAY WELDER Dept. DPS-2 Kearney, Nebraska

"I call it a bad day if I don't make \$25 before noon"

(This chair alone brought \$4.50 with twenty-five minutes work and 32¢ in cleaning materials.)

"Just a few months ago I made the big move. I gave up my job and started spending all my time in the little business I had been running on the side. It wasn't an easy decision, but, now I'm tickled to death I made it. Not just because I'm my own boss or because I have an excellent chance of making over \$10,000 this year. It goes deeper than that.

"You see, this idea has caught on like wildfire in my town. Not a day goes by without my phone ringing with women calling for appointments. The beauty of it is that once a woman becomes my customer, she calls back year after year. Not only that, she tells her friends, too, and they call me. Before I know it I'm swamped with work. (And at \$7.50 an hour net profit it doesn't take long before my bank account is really mushrooming.)

"Funny thing, but back last year, before I started, I never realized the money there was in this business waiting for someone to come along and collect it. Just think: every house in town has furniture and most have rugs or carpeting. I concentrate on just the better homes and have more work than I can handle. You know why? Because women are fussy about their furnishings. Can't stand to see them dirty. That's why they call me over every year.

"The average job is worth \$25.00 to me and takes a little over 2 hours. Out of this, after paying for materials, advertising and other expenses I net about \$15.00 clear profit. This means I need just 3 jobs a day to clear \$11,250.00 in a year. Frankly, since this will be my first full-time year I'll be glad to hit the \$10,000 mark. But after that this business should grow larger each year until I have to hire men to help me handle the business.

Personally Trained

"Believe me there's nothing magic about it. I didn't know a thing about cleaning home furnishings before I became a Duraclean dealer. But after my application was accepted, I was trained in their factory-training school and by a dealer in a nearby town. I was astonished by the short time it took me to become an expert. Actually, much of the credit must go to the Duraclean process, which is so safe it has earned the Parents' Magazine Seal.

"The portable machine you see is just one of the electrical machines I use. It manufactures a light aerated foam with a peculiar action chemists call 'peptizing'. It means that instead of being scrubbed deep into the fabric, dirt is gently ABSORBED by the foam, leaving the fabric clean all the way down. Women can't believe their eyes when they see how it works. Colors appear bright again, and rug pile unmats and rises like new. I don't have to soak rugs or upholstery to get them clean, which ends the problem of shrinkage, and means the furnishings can be used again the very same day. This alone has brought me a lot of customers.

"As a Duraclean dealer I make money with four other services, too: **Duraproof**, which makes furnishings immune to moth and carpet beetle damage (it's backed by a six year warranty). **Dureshield**, a brand new dirt-delaying treatment. It coats fabrics with an invisible film that keeps dirt out. **Duraguard**, another new service, flameproofs draperies, upholstery and carpets to reduce charring

by
Harold Holmes



and the tendency of fires to flame up. And **Spotcraft**, which consists of special chemical products for removing stubborn spots and stains. On jobs where I perform all five services, I multiply profits!

"One of the nicest things about being a Duraclean dealer is that I get continuous help from Duraclean Headquarters. My services are nationally-advertised in famous magazines like McCall's, House Beautiful and many others. I also get a complete advertising kit prepared by experts. (There's even a musical commercial!) I get a monthly magazine full of methods to build business and I can meet with other dealers at Duraclean conventions. I'm also backed by insurance. In fact there are over 25 regular services I get under their unique System.

No Shop Needed

"Maybe you too would like to break away from your job and make a fresh start in a business of your own. Do you need a shop? Certainly not. I operate from home. Need a lot of money to start? Not at all. Duraclean finances reliable men, after a moderate down payment, and furnishes enough supplies to return your TOTAL investment.

"You get everything you need: equipment, supplies, advertising matter, personal training and regular help from Headquarters. To get all the details, fill out the coupon. There's no obligation and you can decide for yourself. I'll say one thing: if you DO become a Duraclean dealer, you'll be glad the rest of your life that you took time today to write."

Irl H. Marshall, Jr., International Headquarters
Desk 1-182 839 Waukegan Avenue, Deerfield, Ill.

Irl H. MARSHALL, Jr International Headquarters
Desk 1-182 839 Waukegan Avenue, Deerfield, Ill.

I'm interested in owning my own business. Please send illustrated booklets and full details FREE outlining the Duraclean Dealership Program and territory arrangement.

Name _____ Please print _____

Address _____

City _____ State _____

PS Puzzlers

By Joan Steen

A file of fillips to foil you . . . Answers on page 210



Pigs That Didn't Go to Market

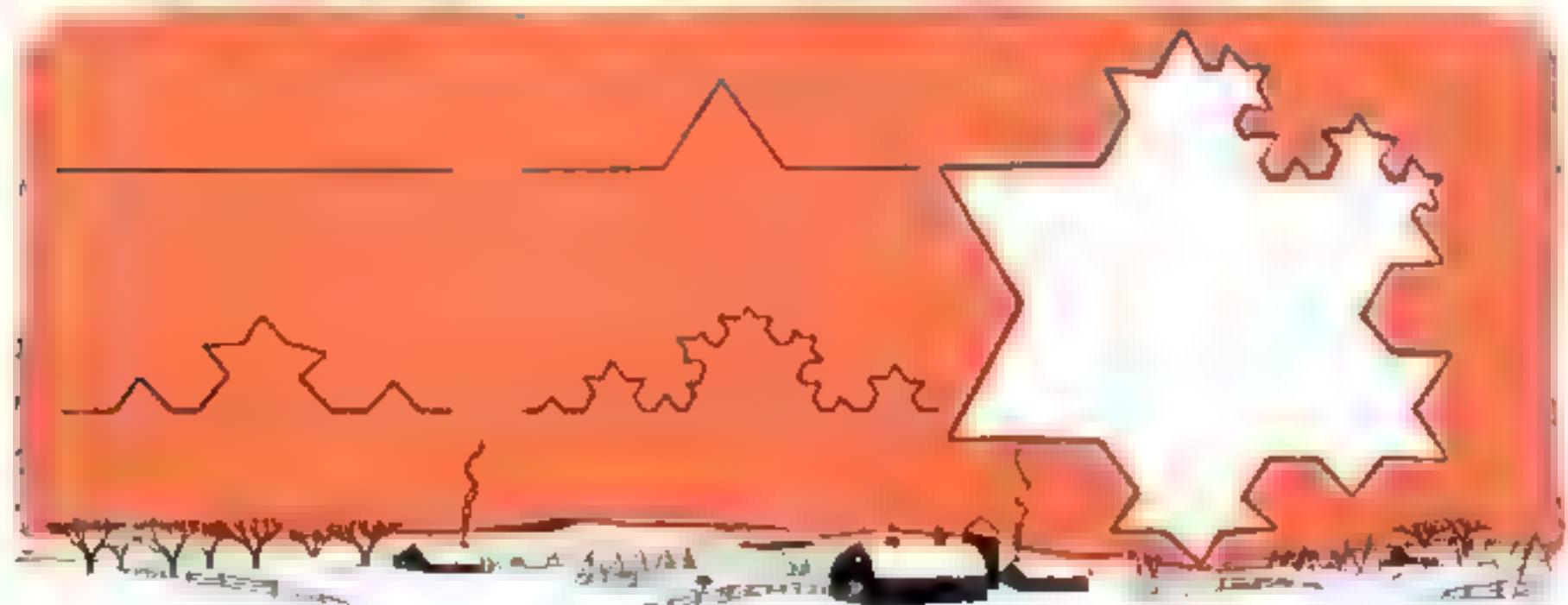
NOT pigs-in-pokes but pigs-in-corners would be a good name for this Lewis Carroll puzzle. Bearing in mind that it has a punning twist, can you house the pigs?

In the kingdom of Kgovjni is a marble square with a pig sty in each corner. Her Radiancy has decreed that 24 pigs be placed in those corners so that as she

goes round the court she always finds the number in each sty nearer to 10 than the number in the last.

"Does she call 10 nearer to 10 than 9 is?" asks a visitor.

"Surely," said the governor. Furthermore, she doesn't just go around once—but again and again—always finding the number in each sty fulfilling her decree.

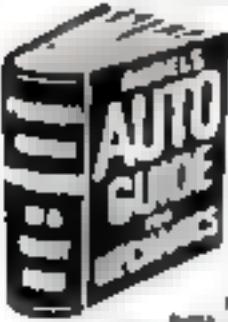


HERE'S a paradox to think about. You might call it the case of the infinite snowflake. Smugly I say I can define a continuous curve (my pencil doesn't leave the paper) on a flat surface in such a way that the whole curve could fit in a space the size of a postage stamp and yet the distance along the curve between a pair of points can be as long as—or

longer than—the distance from the earth to the sun. Out of my mind, you say? Here goes:

Start with a line segment one unit long. Take the middle third of it and on it construct an equilateral triangle. Now erase the base line. My curve is now made up of four little segments. Now take each of these segments in turn and

WHAT ALL AUTO MECHANICS WANT TO KNOW



The Big Practical Book gives full information with working diagrams, covering the principles, construction, operation, service and repair of such auto cars, trucks and buses.

Air Conditioners, Hydromatic & Power Drives Fully Explained

A complete guide of 1132 Pages. It's never been so easy to learn the working and do-it-yourself methods of working on parts, with many hints from the experts for service jobs. Completely up-to-the-minute! Priced at only \$10.

CIRCLE No. 1 IN COUPON

HOW TO USE HOME APPLIANCES

REFRIGERATORS **TOASTERS** **IRONING** **VACUUM**
WARMERS **BEST** **RANGES** **PANTRY**

Many other C-41 and ELECTRIC APPLIANCES

Mandy's Reference for Electric & Gas Home Kitchen Mechanics, Doctors and Housewives. Explains clearly and simply how to handle housework. How to test, assemble and connect wiring, etc. 1000 Pages. Easy to understand. Answers ALL your questions. 340 Pages. Illustrated Only. \$6.

CIRCLE No. 2 IN COUPON



TV TELLS HOW TO ANSWER RADIO RADIO-TV QUESTIONS SERVICE LIBRARY

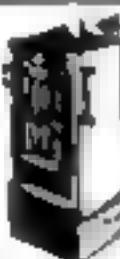
MADE TO LAST INFORMATION
FOR A BETTER HOME FOR RADIOS
AND TELEVISIONS EXPERTS AND STUDENTS

TWO COMPLETE VOLUMES
342 Pages. 1500 Diagrams and
Diagrams. 1000 expert Facts and
Facts on Modern TV Sets.
Vol. 1 - **DO'S AND DON'TS**
INCLUDES TRANSISTORS & TRANSFORMERS,
CIRCUIT BREAKERS, REED & CHARGE
CIRCUITS, PHONO AND PICK-UP
FM Auto Radio, Short Waves,

Basic Principles, Circuit Analysis, In
Tubes and Transistors, TV
Lamps, Troubleshooting, How to
Repair, Clear TV Pictures, Invert
Amp, New in Test Equipment, CTR, CB
SYSTEMS, Methods of Construction, Term
and Frequency, High Frequency Oscil
ators, etc. 342 pages. \$10.00 for
BOTH volumes. * CIRCLE No. 3 IN COUPON

OIL BURNERS

New complete explains in detail both
domestic and commercial burners. In
stallation, adjustment and running the
burner. Full working diagrams and
charts. Many tables of information, testing
methods and parts of all equipment. Fea
turing the latest refinements. Over 400
Pages. 300 Illustrations and Diagrams.
Only \$10.



CIRCLE No. 20 IN COUPON

ALL TYPES OF BLUEPRINT READING

How to read easily the standard technical data and informa
tion given working drawings. How to read
schedules. THE MAN WHO CAN READ PLANS
IS IN LINE FOR A BETTER JOB. This book gives
the secret language step by step in easy stages. 410 Pages.
Very Fully Illustrated. Priced at \$10.

CIRCLE No. 21 IN COUPON

PLUMBERS AND STEAMFITTERS GUIDES

Practical Tools Are Here & Better
and So Easier to Learn Language
and by Step-by-step diagrams
that graphically give you a
series of modern plumbing practice
including Pipe Fitting and Air Con
ditioning. 4 Vols. 340+ Pages.
300+ Diagrams & Illustrations. Make
this the complete set of books.
Solid and valuable. \$15.00 each.

CIRCLE No. 4 IN COUPON

7-DAY FREE EXAMINATION

SEND NO MONEY. Pay the postage nothing. We are
glad to send you any of the Audit Guides for absolutely
FREE examination at your own home. We take all the risk
and leave all the decisions up to YOU. There is no obligation
if you decide to keep the books of course. Then the first
year for them under our refunding plan you pay only
\$12 a month.

[HERE IS ALL YOU DO]

IT'S EASY TO ORDER. In the Mail Order
Coupon of the right just write a check amount the number
of Audit Guides you want us to send you for FREE
EXAMINATION. We will send them to you at once.
Help you build a brighter future by increasing your SKILL.
If you are one of all who are now COMPLETELY new
and return the books to us and that will end the contract.
NO STRINGS OR CATCHES TO THIS OFFER.

THEO. AUDEL & CO.

69 West 23rd Street, New York 10, N. Y.

CARPENTERS AND BUILDERS GUIDES



PRACTICAL STOREHOUSE OF MODERN CONSTRUCTION INFORMATION A real job for carpenters and all woodworkers. Complete in easy language and large illustrations, principles advanced, short cuts, tools, etc. All 1000 pages. Vol. 1 Tools and square saws, Vol. 2 - Sawing, Vol. 3 - Mathematics, drawing, carpentry, estimating, etc., Vol. 4 - Nails and framing, Vol. 5 - Carpentry, Vol. 6 - Tools, Vol. 7 - Carpentry, Vol. 8 - Tools, Vol. 9 - Carpentry, Vol. 10 - Carpentry. CIRCLE No. 5 IN COUPON

PRACTICAL ELECTRICITY

A COMPLETE HANDBOOK Quick, simplified study aid volume. Complete answers and practical information on the rules and laws of electricity. Maintenance of Motors and AC and DC Motors. Alternators. Wiring Diagrams. Motor Lighting. Power Wiring. Safety. Radios. Transistors. How to Simplify to understand. 1032 Pages. 2400 Illustrations. Priced at \$15. CIRCLE No. 6 IN COUPON



ALL THERE IS TO KNOW ABOUT MODERN DIESEL ENGINES Your complete working handbook. Using fuel

oil, gasoline, kerosene, etc. Diesel engines, marine, locomotive, industrial, etc. 1000 pages. CIRCLE No. 7 IN COUPON

MASONS



including how to figure and calculate square feet
etc. How to work bricklaying, building designs. Vol. 1
Brick foundations, arches, tile setting, refractory, Vol. 2
Concrete, paving, stone, reinforced concrete, Vol. 3
Plastering, stone, stucco, steel, wire, brick, stone, Vol. 4
Vol. 4-1000 Pages. 304 Illustrations. Complete. Priced at only \$10.

CIRCLE No. 8 IN COUPON. \$10.00 each volume.

MATHEMATICS MADE EASY

THE COMPLETE HOME STUDY COURSE
Starting with the first principles of arithmetic, advancing step by step through the various stages of mathematics including the ratios and proportions, fractions, decimals, percentages, etc. How to solve difficult problems. New EASY work methods. In
order plan and to prevent difficulties in algebra, trigonometry, etc. Priced at only \$10.00. 944 Illustrations and formulas. Priced at only \$12.00.

CIRCLE No. 9 IN COUPON. \$10.00 each volume.

NEW MACHINISTS AND TOOLMAKERS HANDBOOK

THE COMPLETE WORKSHOP HANDBOOK

Machine Tools, Drawings, Scales, Tables, etc. 1000 pages. 1000 illustrations. Complete. Priced at only \$10.00. CIRCLE No. 10 IN COUPON

ELECTRIC MOTORS

THIS GUIDE covers the construction, design, use of motor starters and switchgear, plus plant and system design. It also includes a chapter on electrical power distribution. The 600 pages of information, 300 Diagrams, 400 sets of working rules, tables and indices, are ready reference. Priced at only \$10.

CIRCLE No. 11 IN COUPON

REFRIGERATION & AIR CONDITIONING

THIS GUIDE is one basic guide for all types of refrigeration. It covers the basic principles of refrigeration, the use of refrigerants and refrigerant mixtures, the use of compressors, the use of condensers, etc. A GLOSSARY of terms of refrigeration. Complete up-to-date. 1000 Pages. Fully illustrated and indexed. Priced at only \$15.00. CIRCLE No. 12 IN COUPON

MAIL THIS NO-RISK COUPON TODAY!

THEO. AUDEL & CO.—Self Improvement Publishers Since 1879—
69 W. 23rd Street, New York 10, N. Y.

Please send me for 7 days FREE EXAMINATION the books I have circled at right. I agree to mail back or credit at my local post office or my address until I have paid the price less free plus shipping and handling. If I am completely satisfied with the Audit Guides I may return them.

NAME _____

ADDRESS _____

OCCUPATION _____

EMPLOYED BY _____

SAVE SHIPPING COSTS! Check here if you enclose complete payment with order. We pay postage charges. You have same return privilege.

KIND MECHANICAL DICTIONARY



THE AUTHORITATIVE WORD BOOK FOR
MECHANICAL TECHNICIANS AND STUDENTS

With the revolutionary program being made available in all mechanical fields, new words and phrases come into use. Any mechanician who wants to be up-to-date must know the new trade language.

AUDEL NEW MECHANICAL DICTIONARY gives you all those new words and also the old. Every mechanician will find his job made easier if he knows the exact meaning and use of technical words that come up every day of work. It is an easy user's shop companion and a student's guide.

PRACTICAL TABLETS FORMULAE, PROCESSES

Constant use of Audel New Mechanical Dictionary will increase your knowledge and skill in a matter of days without any conscious effort on your part. The right word at the right time is the right tool — for sure you have it just use it! Contains 17,000 words. Terms, processes & rules and formulas. 712 pages only \$6.95.

CIRCLE No. 13 IN COUPON



THE NEW ELECTRIC LIBRARY

A COMPLETE IN-DEPTH LIBRARY on the principles, terms, symbols and applications of applied

& COMPLETE COLLEGE EDUCATION!

Fully illustrated with diagrams and sketches, tables and formulas. Questions and answers. All based on the best Student Texts.

Vol. 1 - Principles and rules of electricity, magnetism, structures, reports. Priced at \$15.

Vol. 2 - Dynamics, DC Motors, generators, magnetic fields, magnetism, magnetometers, etc. Priced at \$15.

Vol. 3 - Tracing instruments and tests, storage batteries, rectifiers, etc. Priced at \$15.

Vol. 4 - Alternating current power factors, voltage regulators, transistors. Priced at \$15.

Vol. 5 - AC Motors, windings, impedimenta, converters, switches, fuses, etc. Priced at \$15.

Vol. 6 - Resistors, condensers, capacitors, coils, meters, telephones, etc. Priced at \$15.

Vol. 7 - Working hours, lights and power costs. Priced at \$15.

Vol. 8 - Radio. Illustrated pages. Priced at poly \$22.95 for the 8 Vol. Set. Also sold individually for \$2.95 each.



WELDERS GUIDE

Welding is about welding, gas and electric processes, arc and plasma cutting, fusion, braze and other welds. Includes such topics as welding, soldering, hard facing, cutting, brazing and 1000 Pages. Fully Illustrated. Only \$15.

CIRCLE No. 14 IN COUPON

ADDITIONAL IMPORTANT TITLES

The following Audit Guides are off the list in these Ads, however in large quantities at wholesale prices. Call or write us for details. We mail on approval. All books are sent for FREE EXAMINATION.

No. 5 - **PLATE & SHEET GUIDE** 1076 Pages. \$10.00

No. 6 - **PAINTING & DECORATING HANDBOOK** 117 Pages. \$1.00

No. 7 - **WIRING DIAGRAMS** 140-8 Pages. \$1.00

No. 8 - **SHIPPING MARKS** 100-120 Pages. \$1.00

No. 9 - **WIRELESS** 100-120 Pages. \$1.00

No. 10 - **TELEGRAPHIC SYMBOLS** 100-120 Pages. \$1.00

No. 11 - **TELEGRAPHIC CODE** 100-120 Pages. \$1.00

No. 12 - **TELEGRAPHIC CODE** 100-120 Pages. \$1.00

No. 13 - **TELEGRAPHIC CODE** 100-120 Pages. \$1.00

No. 14 - **TELEGRAPHIC CODE** 100-120 Pages. \$1.00

No. 15 - **TELEGRAPHIC CODE** 100-120 Pages. \$1.00

No. 16 - **TELEGRAPHIC CODE** 100-120 Pages. \$1.00

No. 17 - **TELEGRAPHIC CODE** 100-120 Pages. \$1.00

No. 18 - **TELEGRAPHIC CODE** 100-120 Pages. \$1.00

No. 19 - **TELEGRAPHIC CODE** 100-120 Pages. \$1.00

No. 20 - **TELEGRAPHIC CODE** 100-120 Pages. \$1.00

No. 21 - **TELEGRAPHIC CODE** 100-120 Pages. \$1.00

No. 22 - **TELEGRAPHIC CODE** 100-120 Pages. \$1.00

No. 23 - **TELEGRAPHIC CODE** 100-120 Pages. \$1.00

No. 24 - **TELEGRAPHIC CODE** 100-120 Pages. \$1.00

No. 25 - **TELEGRAPHIC CODE** 100-120 Pages. \$1.00

No. 26 - **TELEGRAPHIC CODE** 100-120 Pages. \$1.00

No. 27 - **TELEGRAPHIC CODE** 100-120 Pages. \$1.00

No. 28 - **TELEGRAPHIC CODE** 100-120 Pages. \$1.00

No. 29 - **TELEGRAPHIC CODE** 100-120 Pages. \$1.00

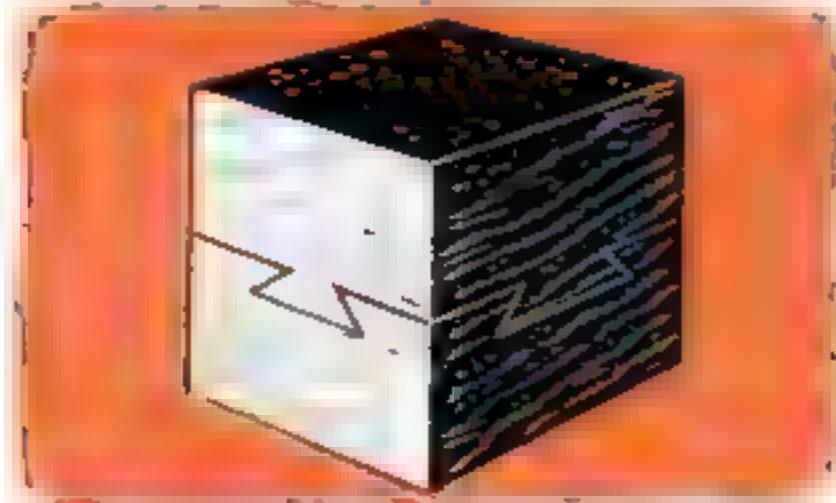
</

PS Puzzlers

continued

construct an equilateral triangle on its middle third, again erasing the base line. Continue the process.

I say that's a well-defined method of constructing a curve whose length can be made as long as I like. (If you start with an equilateral triangle as your original figure, you get the snowflake figure shown on the previous page.) Am I right?



Puzzle of the month



THERE'S a nice twice-told puzzle about odd-weighted balls that I'm quite fond of. For those not familiar

Answer to last month's P.O.T.M. Two travelers start at the same time, go in opposite ways around a circular railway. West's train takes 2 hours; East's 3. If trains are leaving the station in both directions every 15 minutes, how many trains did each traveler pass en route—not counting trains met at the station itself?

Eastbound trains take 180 minutes to make the loop. At the end of 15 minutes they're $\frac{1}{12}$ the way around, so we can think of them arranged around the circle at 30-degree intervals. Westbound trains cover $\frac{1}{4}$ the distance every 15 minutes so they're at 45-degree intervals.

Now think of those degrees of arc as units of distance. Then as East starts out

NO PENCILS for these quickies

1. Three horizontal lines are an inch apart and directly under one another. Now imagine three vertical lines, also an inch apart, that cut all three horizontals. How many squares are formed?

2. Where on earth can you walk north, turn left making a right angle, and find yourself facing east?

3. Uncle Harry bought a baseball and a bat. The bat cost him a quarter more than the ball. How much did each cost if together they cost \$1.25?

IS THERE a woodworker in the house?

I possess an unusual complement of left hands, so I leave it to the more dexterous of you to solve this one:

Two solid pieces of wood have been neatly dovetailed as in the diagram at left. The hidden two faces show similar joints. How was it done? (Five minutes in the shop and you'll probably have it all modeled.)

with it, here it is—in the macabre way one reader (himself a pharmacist) decided to tell it:

There are 12 tablets in a prescription bottle. One of them is known to contain a lethal poison. While it looks the same as the others it does have a distinguishing characteristic: It's either lighter or heavier than the others. Can you determine in three independent weighings on a balance which is the deadly pill and which way it's off weight? (Answer next month.)

he will meet a westbound train coming towards him from 45 units away. Since the westbound rate is half again as fast as the eastbound, the trains will meet when East has gone exactly 18 units, West exactly 27 units. So East will meet a westbound train every 18 units around the circle.

West on the other hand leaves the station and will meet an eastbound train coming towards him from only 30 units away. Again he goes at a rate $1\frac{1}{2}$ times as fast, so he covers 18 units, the eastbound train only 12 units when they meet. Now 18 into 360 means 20 encounters for each train—but since we don't count trains met at the station itself, the total is 19 each. East meets West after 72 minutes.



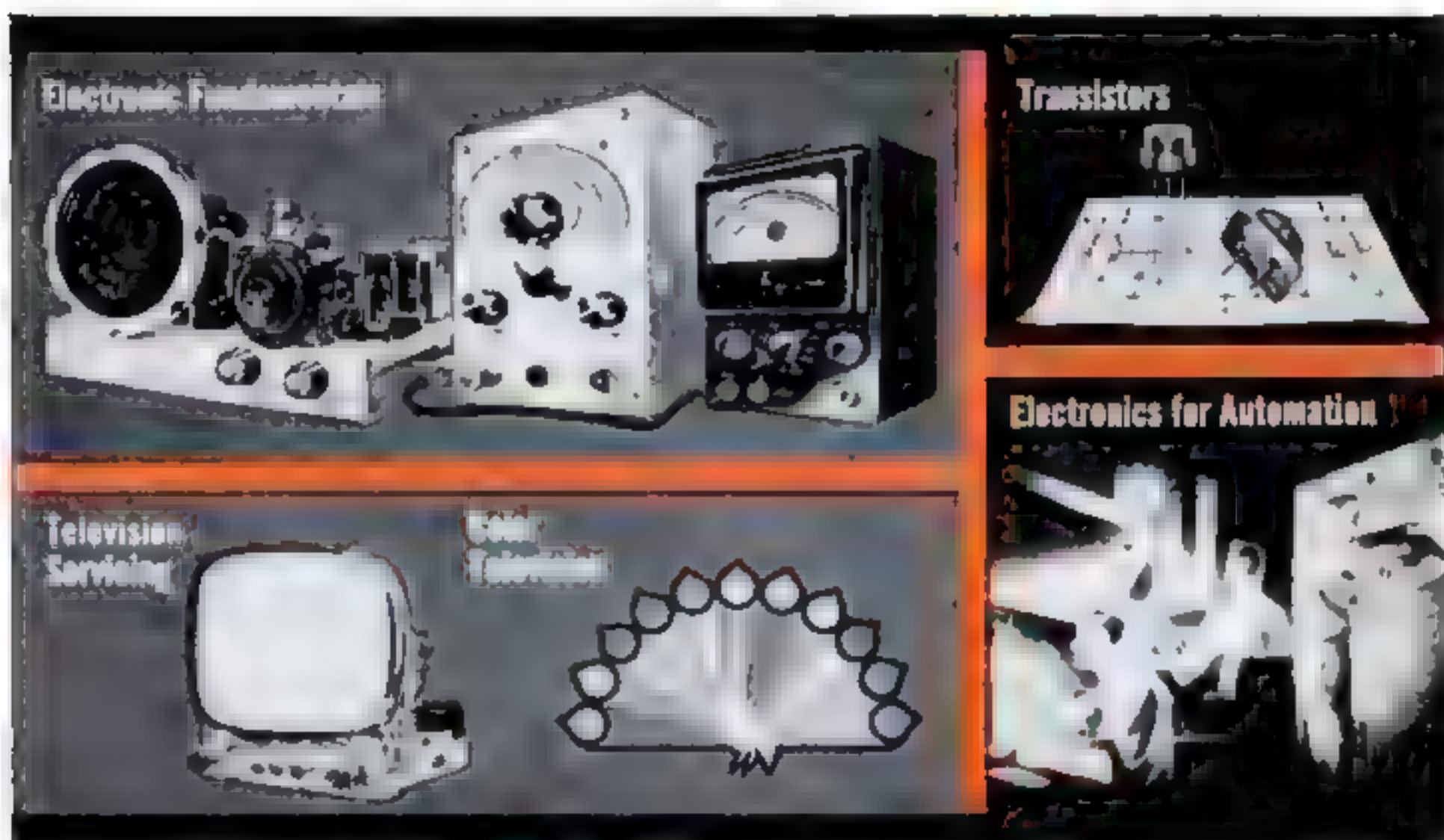
LET RCA TRAIN YOU IN ELECTRONICS

RCA Institutes, one of the world's leading electronic technical schools, offers Home Study Courses in . . .

RADIO, TV, TRANSISTORS, AUTOMATION

. . . Now you have five comprehensive courses for your electronic training. Practical work with the very first lesson. With the new Voluntary Tuition Plan, you pay for each study group only when you order it. If you interrupt the course at any time, for any reason, you don't pay until you resume the course.

Even if you have not completed high school, you can begin your electronic career training at RCA Institutes. Choose from any of these courses.



Send for our
64 page Home
Study Catalog

FREE!

RESIDENT SCHOOLS In New York City and Los Angeles offer Technical Institute and Vocational School Courses in Electronics. Day and Evening classes start 4 times each year. Resident Schools Catalog sent free on request.



RCA INSTITUTES, Inc. Home Study School, Dept. PS-21

A Service of Radio Corporation of America

350 West Fourth Street, New York 14, N. Y.

Please rush me your FREE illustrated 64 page book "Your Career in Electronics," describing your home training programs. No obligation. No salesman will call.

Name _____

Please print _____

Age _____

Address _____

City _____

Zone _____

State _____

Veterans: Enter discharge date _____

CANADIANS — Take advantage of these same RCA courses at no additional cost. No postage, no customs, no delay. Send coupon to: RCA Victor Company Ltd., 5581 Royalmount Ave., Montreal 9, Quebec. To save time, paste coupon on postcard.

GET READY FOR THE SPACE AND SCIENCE ERA! SEE SATELLITES, MOON ROCKETS CLOSE-UP



AMAZING SCIENCE BUYS

FOR FUN, STUDY OR PROFIT



See the Stars, Moon, Planets Close Up!

3" ASTRONOMICAL REFLECTING TELESCOPE

60 to 180 Power—Famous Mt. Palomar Type! An Unusual Mirror Assembled—Ready to use! You'll see the Rings of Saturn, the fascinating planet Mars, huge craters on the Moon, Star Clusters. Moon of Jupiter in detail. Galilean Equatorial mount with lock on both axes. Aluminumized and over-coated 3" diameter high-speed f/10 mirror. Telescope comes equipped with a 60X eyepiece and a mounted Barlow lens, giving you 60 to 180 power. Low cost accessory eyepieces available for higher powers. An Optical Finder Telescope always so essential, is also included. Sturdy, hardwood, portable tripod. F.L.E. with Scope—
—Valuable STAR CHART plus \$7.50 page "HANDBOOK OF HEAVENLY BODIES" plus "HOW TO USE YOUR TELESCOPE" BOOK. Stock No. 86,000-N \$29.95 Postpaid

4 1/4" ASTRONOMICAL TELESCOPE UP TO 250 POWER!
New Vibration Free Metal Pedestal Mount
With this scope you can see everything as above but with greater power plus with up to 100 stars. Mirror has twice the light gathering power of. Mirror guaranteed to give theoretical limit of resolution. Back and pinion focused. Real equatorial mounting—only one adjustment follows stars. A 60 mm tube 3 power divider telescope. 3 stabilized size eyepieces and mount add the low cost give you powers of 40X, 90X, 120X, and 180X. Low cost accessory eyepieces available for higher powers. F.L.E. with Scope—
—Valuable STAR CHART plus 272 page "HANDBOOK OF HEAVENLY BODIES" plus "HOW TO USE YOUR TELESCOPE" BOOK. Shipping weight 16 lbs. Stock No. 86,100-N \$79.95 f.s.b.

MAGNETISM AND MAGNETS
Small low-priced ceramic magnets. 3/4" x 1". Blinks any metal surface a bulletin board. Stock No. 40,428-N Pkg. of 12 \$1.00 Postpaid. Stock No. 80,142-N Pkg. of 100 \$3.90 Postpaid
Personal pocket magnet. Powerful 1" square x 1/2" deep Alnico magnet. Picks up 4 1/2 lb. holds 4 lb. With keeper in leatherette case. Stock No. 40,424-N \$1.99 Postpaid.
Magnet Set. Ideal for learning about magnetism. Two cylindrical magnets, one U-shaped and one horse magnet. All of steel. approx. 3" long. Stock No. 40,398-N \$1.75 Postpaid.
Cylindrical Alnico Magnets. High strength. Ideal for demonstrations, such 2 1/2" diam. x 5" long. Stock No. 80,131-N (One Pole) \$3.00 Postpaid.



ANALOG COMPUTER KIT

Demonstrates basic analog computing principles—can be used for multi-pole log, division, powers, roots, log operations, trig problems, physics formulas, electricity and magnetism problems. Easily assembled with screwdrivers and pliers. Operates on 2 flashlight batteries. Electric timer and 3 potentiometers are mounted on circuit board. Answer is indicated on dual computer in 20" long, 7" wide, 3" deep. Stock No. 70,341-N \$14.95 Postpaid



SCIENCE TREASURE CHESTS

For Boys—Girls—Adults!

Excellent "Science Fair" Material!

Science Treasure Chest. Extra powerful magnets, polarizing filters, diaphanes and many more items from detailed fraction grafting and lots of other items for fun, hours of thrilling experiments, plus a Ten Lens Kit for making microscopes, cameras, etc. Full instructions in book. Stock No. 70,342-N \$5.00 Postpaid



BUILD A SOLAR ENERGY FURNACE

A fascinating new field. Build your own Solar Furnace for experimentation in many practical uses. Easy to assemble! Low cost! Wood fuel only. This sun powered furnace will generate heat the best 2000° to 3000°. Paint enamel to metal. Sets paper afire in seconds. Use our Fresnel Lens—11" diameter. 11" 14". Stock No. 70,130-N \$4.95 Postpaid

ORDER BY STOCK NUMBER . . . SEND CHECK OR MONEY ORDER . . . SATISFACTION GUARANTEED

EDMUND SCIENTIFIC CO. BARRINGTON, NEW JERSEY

NEW! SCIENCE FAIR PROJECT KITS

Carefully planned to give any boy or girl the fun and excitement of discovering science facts. Can lead to awards or scholarships!



For Junior High School and beyond:

MOLECULE AND CRYSTAL MODELS KIT

Tools and basic materials to make atomic models plus three books. Stock No. 30,413-N \$2.50 Postpaid

NUMBER SYSTEMS ABACUS

Makes a dramatic exhibit demonstrating number systems other than the decimal system. Stock No. 70,314-N \$4.25 Postpaid

SOIL TESTING KIT

Tools for many fascinating paper projects including a 1000 ml plastic jug. Stock No. 80,148-N \$2.00 Postpaid

TOPOLOGY

Kit for topologists for a project on 4 color map problem. 31 sheets of the like. Stock No. 70,353-N \$3.00 Postpaid

CRYSTAL GROWING KIT

Grow breathtaking display of large crystals with this set. Stock No. 70,336-N \$9.95 Postpaid

For Ages 8 thru Jr. High School:

MAGNETISM KIT

Based on magnetism demonstrations developed by L. NEWTON. Stock No. 70,328-N \$3.75 Postpaid

COLOR THROUGH POLARIZATION

Show the beautiful colors of rainbows seen by passing polarized light through transparent objects. Stock No. 70,350-N \$2.00 Postpaid

OPTICAL ILLUSION KIT

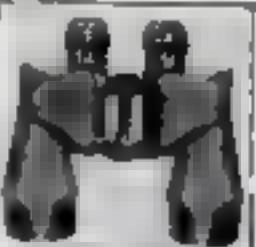
Diagrams, lenses, mirrors, etc. for producing many amazing optical illusions. Stock No. 70,337-N \$3.00 Postpaid

War Surplus American-Made 7x50 Binoculars

New American brand new! Crystal clear view for 3 1/2 miles. Heavy duty, all elements in focus.

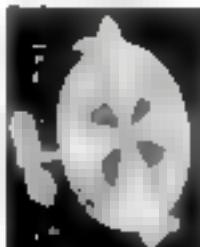
An excellent night glass. The wide viewing angle is 10 degrees. The dual eye focus lens provides binocular vision. Weight 1.000 lbs. in 374 ft. diameter case included. American 7 x 50's normally cost \$100. Our war surplus price leaves a real savings.

Stock No. 15328-N Only \$35.00 postpaid. Tax included!



Circular Diffraction Grating Jewelry

A Dazzling Rainbow of Color!



Exquisite beauty. Just as a prism breaks up light into a full range of individual colors, so does the D.R. act to a single, "dazzled"

Stock #30,313-N Earrings \$2.75 Pad.

Stock #30,350-N Cuff Links \$2.75 Pad.

Stock #30,372-N Pendant \$2.75 Pad.

Stock #30,390-N Tie Clips \$2.75 Pad

OPAQUE PROJECTOR

Projects illustrations up to 18" x 24" and enlarges them. No film or negatives needed. Projects charts, diagrams, pictures, photos, lettering in full color or black and white. Operates on 115 volt A.C. current. 8 ft. extension cord and plug included. Operates on 60 watt bulb. Not included. Size 12" x 8" x 4 1/2" wide. Weight 1 lb. 3 oz. Plastic case with built-in handle. Stock No. 70,198-N \$7.95 Postpaid

MINIATURE WATER PUMP
Wonderful for experiments, miniature waterfalls, fountains, Christmas gardens, 3D gauge railroad backdrops, etc. Size 2 1/2" x 1 1/2" electric hand pump for fish tanks, etc., also suitable for pumping up flow of water in tank of one pint per minute at a 2' head. W. 1 1/2" H. 1 1/2" D. Batteries in series will pump to 24" head. Works in either direction. Stock No. 50,345-N \$3.95 Postpaid

NEW! PORTABLE FLUORESCENT LIGHT Plugs into CAR CIGARETTE LIGHTER!

Provides bright light without fumes or noise or danger of fire or explosion from batteries, etc. It is excellent for camping trips, picnics, in garages, on patio, farms or boats. It is a vital necessity when storms interrupt electric service. Can be used without a car for 18 hours without having to drain the car—uses less power than parking lights. This 18" long, 2 1/2" wide, 1 1/2" high, 12 volt fluorescent lamp complete with 12 volt cigarette power pack, 15 watt fluorescent tube, 7' foot cord. (Will not work on household current). Stock No. 70,356-N (8 volt) \$14.95 Postpaid. Stock No. 70,357-N (12 volt) \$14.95 Postpaid.

FREE CATALOG-N

144 Pages over 1000 Items!

Complete line of Astronomical Telescopes, binoculars and accessories. Also huge selection of lenses, prisms, 3D gauges, optica, gratings, filters, parts and accessories. Telescopes, binoculars, microscopes, infant microscopes, science experimental items, math learning and teach kits, etc.

REQUEST CATALOG-N



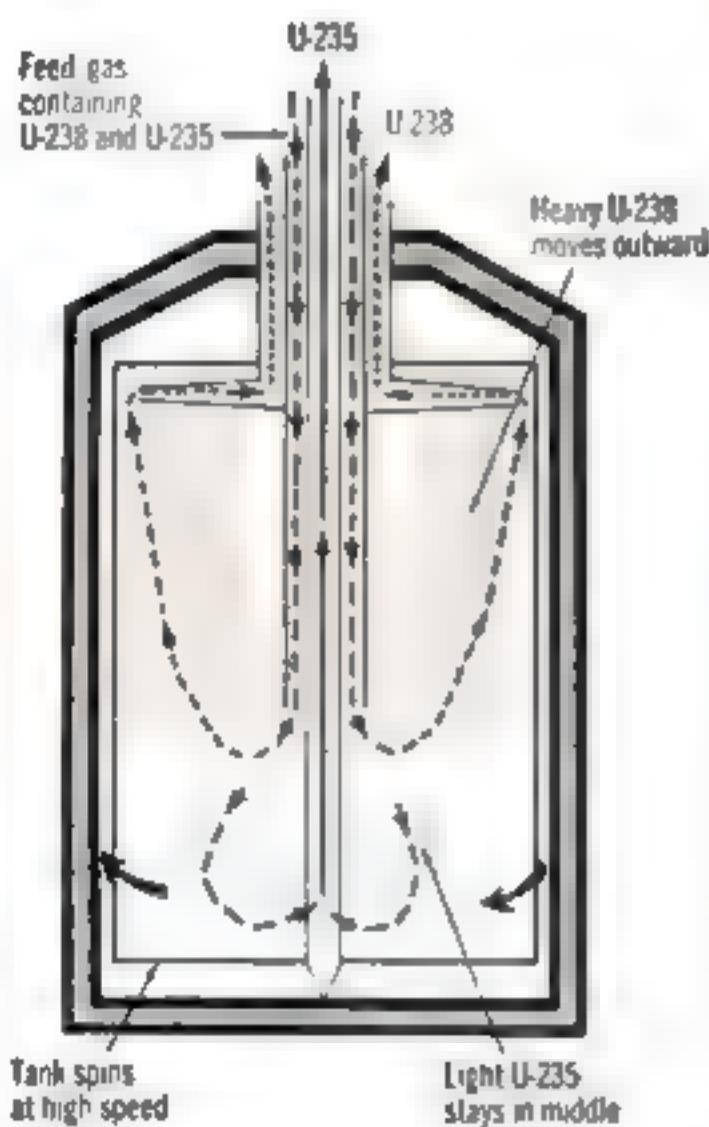
The month in science

Do-it-yourself A-bomb kit. A whining little machine resembling a souped-up cream separator threatens to blast all the pet schemes for insuring peace through the control of atomic weapons. The little machine makes uranium 235, the explosive for atomic bombs.

It's cheap. Any little old country could arm itself with A-bombs, then H-bombs . . . Cuba, Egypt, Spain, Saudi Arabia.

Until now only the richest nations could afford the Deadly Gadgets. Manufacturing them has required a fabulous investment in plants to produce the necessary uranium. Pure uranium metal, as refined from the ore, contains less than one percent of the special atoms—U-235—that will split. To make bombs, you need uranium that is 90 percent U-235. The only handle for picking the rare U-235 atoms out of the plentiful U-238 is a minute difference in weight (each U-235 atom is lighter by three neutrons).

How "cream separator" makes atomic explosive



The separation scheme adopted by the U.S. (and copied by Russia) was gaseous diffusion: The light U-235 passes through porous nickel filters more easily than the heavy U-238. The K-25 diffusion plant in Oak Ridge, Tenn., is the largest continuous-process plant in the world under one roof—a 60-acre roof. It cost one billion dollars and uses more electricity than New York City. This sort of thing, obviously, is out of Señor Castro's price range.

The man who broke the price on A-bomb stuff is a cosmopolitan German named Germot Zippe. He plugged away at the gas centrifuge, an idea that the Manhattan Project tried and

dropped (it wouldn't work well with materials available in the Forties). This machine separates the uranium types by spinning them inside a fast-rotating tank. The heavy U-238 is forced to the wall of the tank—like cream in the dairy machine—while the light U-235 stays near the middle.

Zippe was interned by the Soviets, and built one centrifuge for them. When they let him go, the U.S. grabbed him to duplicate that machine here, at the University of Virginia. Then he went home to Germany and designed a really good one for the Degussa firm, of Frankfurt.

The newest centrifuges will have superstrong titanium tanks about a yard in diameter that can whirl 40,000 r.p.m. without

The month in science continued

breaking up. Such a fast spin exerts the tremendous forces needed for efficient concentration of U-235. With 50 of Zippe's machines working together in stages, you could separate 100 pounds of 90-percent U-235 in a year. That will make one bomb. A few are enough.

Apparently Degussa can manufacture such centrifuges with no more trouble than GM making Cadillacs. The price: \$5,000 each. Brazil has already bought two early models.

Using centrifuges, a few million dollars (which can always be squeezed out of the peasants) is enough to go into the A-bomb business. It would take about eight years to get rolling, thinks AEC Chairman John McCone. Unless a nuclear control plan jells before then, the weapons of total destruction may be almost as easy to come by as .30-caliber Enfields are now.

Think small (cont'd.). When Caltech's Dick Feynman urged tinkerers to try their hands at building *really* small machines (Nov. '60), he backed up his plea with cash: a \$1,000 prize to "the first guy who makes an operating electric motor which can be controlled from the outside and is only 1/64 inch cube." Professor Feynman added, "I do not expect to wait very long for claimants."

He didn't.

William McLellan, a young California engineer specializing in miniature parts, has now collected the prize with what is almost certainly the smallest motor ever built. It is .006 inch in diameter—smaller than the period at the end of this sentence. You have to use a microscope to see it work.

McLellan spent 2½ months of spare time making his tiny motor, using a watchmaker's lathe, a microscope, and a sharp toothpick. It draws .05 ampere and puts out all of one millionth of a horsepower. Within its fantastically small size are crammed 13 parts, including a rotor, a quartz bearing, and four coils each wound with 21 turns of .002-inch-thick wire. There's no practical use for it (except to win the \$1,000).

How small you can get: motor in front of pinhead



Still open (at press time, anyway) is another Feynman prize: \$1,000 to "the first guy who can take the information on the page of a book and put it on an area 1/25,000 smaller in linear scale in such manner that it can be read with an electron microscope."

Scuffproof shoes. You'll get seven times the wear from shoes made of a new plastic-treated leather, coming out soon. The plastic is urethane (related to foam for cushions), also good for protecting golf balls, bowling pins, flooring, auto parts.

I'd like to give this to my fellow men...

while I am still able to help!



I was young once, as you may be—today I am older. Not too old to enjoy the fruits of my work, but older in the sense of being wiser. And once I was poor, desperately poor. Today almost any man can stretch his income to make ends meet. Today, there are few who hunger for bread and shelter. But in my youth I knew the pangs of poverty; the emptiness of hunger; the cold stare of the creditor who would not take excuses for money. Today, all that is past. And behind my city house, my

summer home, my Cadillac, my Winter-long vacations and my sense of independence—behind all the wealth of cash and deep inner satisfaction that I enjoy—there is one simple secret. It is this secret that I would like to impart to you. If you are satisfied with a handmaiden life of service to another master, turn this page now—read no more. If you are interested in a fuller life, free from bosses, free from worries, free from fears, read further. This message may be meant for you.

By Victor B. Mason

I am printing my message in a magazine. It may come to the attention of thousands of eyes. But of all those thousands, only a few will have the vision to understand. Many may read, but of a thousand only you may have the intuition, the sensitivity, to understand that what I am writing may be intended for you—may be the tide that shapes your destiny, which, taken at the crest, carries you to a level of personal independence heretofore undreamed of.

Don't misunderstand me. There is no mysticism in this. I am not speaking of occult things; of immutable laws of nature that will sweep you to success without effort on your part. That sort of talk is *rubbish!* And anyone who tries to tell you that you can think your way to independence without effort is a false friend. I am too much of a realist for that. And I hope you are.

I hope you are the kind of man—if you have read this far—who knows that anything worthwhile has to be earned! I hope you have learned that there is no reward without effort. If you have learned this, then you may be ready to take the next step in the development of your karma—you may be ready to learn and use the secret I have to impart.

I Have All The Money I Need

In my own life I have gone beyond the need of money. I have it. I have gone beyond the need of gain. I have two businesses that pay me an income well above any amount I have need for. One of these businesses is that of putting other men in business for themselves. And, I have the satisfaction—the deep satisfaction—of knowing that I have helped more than three hundred other men find independence from job worries by starting "side line" business that could be operated from the home in spare time. Since I have no need for money, the greatest satisfaction I get from life, is sharing my secret of personal independence with others—seeing them achieve the same heights of happiness that have come into my own life.

Please don't misunderstand this statement. I am not a philanthropist. Although I may help finance you in a business-like

way, I believe that charity is something that no proud man will accept. I have never seen a man who was worth his salt who would accept something for nothing. I have never met a highly successful man whom the world respected who did not sacrifice something to gain his position. And, unless you are willing to make at least part of the effort, I am not interested in giving you a "leg up" to the achievement of your goal. Frankly, I'm going to charge you something for the information I give you. Not a lot—but enough to make me believe that you are a little above the fellows who merely "wish" for success and are not willing to sacrifice something to get it.

A Fascinating and Peculiar Business

One of the businesses in which I have helped others get a start is a peculiar one. The unusual thing about it is that the product is needed in every little community throughout this country. But it is a business that will never be invaded by the "big fellows." It has to be handled on a local basis. No giant octopus can ever gobble up the whole thing. No big combine is ever going to destroy it. It is essentially a "one man" business that can be operated without outside help. It is a business that is good summer and winter. It is a business that is growing each year. And it is a business that can be started on an investment so small, that, with my help in financing, is within the reach of anyone.

This business has another peculiarity. It can be started at home in spare time. No risk to present job. No risk to present income. And no need to let anyone else know you are "on your own." It can be run as a spare time business for extra money. Or, as it grows to the point where it is paying as much or more than your present salary, it can be expanded into a full time business—overnight. It can give you a sense of personal independence that will free you forever from the fear of lay-off, loss of job, depressions, or economic reverses.

Are You Mechanically Inclined?

While the operation of this business is partly automatic, it won't run itself. If you are to use it as a stepping stone to personal independence, you must be able to work with your hands, use such tools as hammer and screw driver, and enjoy getting into a pair of blue jeans and rolling up your sleeves. But two hours a day of manual work will

keep your "factory" running 24 hours turning out a product that has a steady and ready sale in every community. A half dollar spent for raw materials can bring you six dollars in cash—six times a day—a maximum daily profit of \$33.00.

In this message I'm not going to try to tell you the entire story. There is not enough space on this page. And, I am not going to ask you to spend a penny now to learn the secret. I'll send you all the information, free. If you are interested in becoming independent, in knowing the sweet fruits of success, in becoming your own boss send me your name. That's all. Just your name. I am not asking you for a penny at this time. I'll send you all the information about one of the most fascinating businesses you can imagine. With these facts, you will make your own investigation. You will check up on conditions in your neighborhood. You will weigh and analyze the whole proposition. Then, and then only, if you decide to take the next step, I'll allow you to invest \$15.00. And even then, if you decide that your fifteen dollars has been badly invested I'll return it to you. Don't hesitate to send your name. I have no salesmen. I will merely write you a long letter and send you complete facts about one of the businesses that has now been started by more than 300 men—and several women. After that, you make the decisions. Remember, if you decide to go ahead, I'll help you finance your start.

Does Happiness Hang on Your Decision?

Don't put this off. It may be a coincidence that you are reading these words right now. Or, it may be a matter that is more deeply connected with your destiny than either of us can say. There is only one thing certain: If you have read this far you are interested in becoming independent of jobs and bosses. And if that is true, then you must take the next step. No coupon on this advertisement. If you don't think enough of your future happiness to write your name on a postcard and mail it to me, forget the whole thing. But if you think there is a destiny that shapes men's lives, send your name now. What I send you may convince you of the truth of that proverb. And what I send you now will not cost a penny, now or ever.

VICTOR B. MASON

1512 Jarvis Avenue, Suite M-3-BN
CHICAGO 24, ILLINOIS



BUILD THIS SUPERB *Schober* ORGAN FROM SIMPLE KITS and save over 50%!

Give Your Family A Lifetime of Musical Joy
With A Magnificent Schober Electronic Organ!

Now you can build the brilliant, full-range Schober CONSOLETT or the larger CONCERT MODEL with simple hand tools! No skills are needed; no woodworking nec-

essary. Just assemble clearly marked electronic parts guided by step-by-step instructions. You build from kits, as fast or as slowly as you please... at home, in your spare time - with a small table serving as your entire work shop.

**THE GREAT
CONCERT
MODEL**
meets
specifications of
American
Guild of
Organists

your own organ and how pleasant it is to learn to play. Also available is 10" LP demonstration record (price \$2.00 - refundable on first order). Send for literature. No obligation and no salesman will call.

Pay As You Build!

Start building your organ at once, investing just \$10.94! The superb instru-

ment you assemble is as fine, and technically perfect, as a commercial organ... yet you save over 50% on quality electronic parts, high-priced labor, usual store mark-up!

Free Booklet

Send for 16-page booklet in full color describing Schober organs you may build for home, church or school, plus articles on how easy it is to build

**Mail This Coupon For FREE Schober Literature
And Hi-Fi Demonstration Record TODAY!**

The Schober Organ Corp., Dept. PS-7
43 West 61st St., New York 23, N. Y.

Please send me FREE full-color booklet and other literature on the Schober organs.

Please send me the 10" hi-fi Schober demonstration record. I enclose \$2.00 (refundable on receipt of my first kit order).

Name _____

Address _____

City _____

Zone _____ State _____

The
Beautiful
Schober
CONSOLETTE

— Only small
organ — in
two parts
44 note key-
boards and
22 ops.
Dimensions only
2 x 3 1/2 foot
space. Com-
plete & ready
app. \$1600
or more.

FIBERGLASS or PLYWOOD

50 Models
6-22 Ft.

FACTORY-DIRECT
PRICES

FREE CATALOG,
WRITE TODAY



18 FT. CRUISERS, 8 Models: from \$369



12, 14, 16, 18 ft. runabouts, ski-
models, convertibles, utilities
\$204 up. 8, 10, 12, 14, 16,
18 ft. racing, fishing, utilities
\$41.95 up.

FIBERGLASS 14 & 16 ft.

From \$299 (at right)

Interlocking units (lower right
photo) snap together, bond into
1-piece boat easily assembled
in one evening.



Luger's preformed
preassembled units
are easily assembled by anyone. Equal
factory built yet save $\frac{1}{2}$ to 35%. FREE
catalog has all details, trailers, ac-
cessories, paint, Fiberglass supplies.

SEND FOR FREE
COLOR CATALOG

MONEY-BACK GUARANTEE
EASY TERMS $\frac{1}{4}$ DOWN

LUGER KITS

Dept. A-2 9700 Access Rd., Minneapolis 20, Minn.

FREE!

100
WORLDWIDE
STAMPS...
just
released!



RUSH REPLY for your free FIFTH edition of 100
different World Wide stamps. Newest issues of the
year — pictorial, commemorative — b-colors — used
and used. Get Togo "Summit Meeting" stamp. New
lands KLM South African Antarctic, colorful masks
of new Upper Volta Republic, many more. Many of these
are numbered — limited so you have them first. Supply
printed only on airmail. Send for this valuable free
catalog and other special offers for approval. Today
Rush reply 10c post and mail to GARCILON STAMP
CO., Dept. PS2X, Cedar, Mo.

GARCILON STAMP CO., Dept. PS2X
Cedar, Mo. Rush FREE 100 Different Stamps, other offers.
Enclosed 10c for handling. (PLEASE PRINT).

Now! Do any car repair this QUICK, EASY WAY

You can "breeze through" engine jobs, tune-ups, front end jobs, brake repairs, steering adjustments, carburetor overhauls, generator servicing — ANY car service or repair job ON THE VERY FIRST TRY!

1

FIND THE TROUBLE!
Just open to "Troublehotline" section in MONTGOMERY'S Repair Manual. Identify any one of more than 1,000 trouble spots and get the exact repair needed. No guess work.

GIANT 1000-PAGE ILLUSTRATED GUIDE SHOWS YOU

2

FIX THE TROUBLE!
Step-by-step instructions, photos, diagrams show how to start, stop, drive, turn, reverse, etc., with every move.

**MOTOR'S
AUTO
REPAIR
MANUAL**

Nearly
1 FOOT HIGH
36 pages
Over 1000 Photos

Used by U.S.
Armed Forces

How to Fix Any Part of Any Car

YEAR MOTOR'S giant new Auto Repair Manual is the answer to practically all your car repair problems. Almost every car repair on every popular car on the road today is explained and illustrated in full-color detail. You will develop new speed and confidence on any repair job you tackle.

Try it FREE a Full Week

Words can't possibly describe the vast contents — the thousands of photos and diagrams — the illustrations — the wonderful feeling when you know you've got the car running like new again!

You've got to see it to believe it! That's why we offer to send it to you at our risk for a FREE seven-day trial. Try it. See how it makes even the toughest jobs seem like child's play. If you're not 100% satisfied just send it back and you won't owe a penny!

Some FREE Offer in MOTOR'S New Truck Manual

Brand new Covers practically EVERY job on EVERY popular make Gasoline and Diesel truck made 1952 thru 1961. FREE 7-Day Trial!

Everything You Need to Know to Fix Cars Like a Pro Mechanic

The instructions and photos are so clear you just can't go

SEND NO MONEY

Just mail the coupon to the Motor Book Dept. and get your FREE 1000-page Illustrated Guide to Fixing Any Part of Any Car. Send with \$1.00 postage and return to:
**MOTOR Book Dept. Desk 122,
230 West 35th St., New York 19, N.Y.** (Please Enclose Bookmarked Write for Discounts.)

COVERS ALL THESE MAKES 1953 Thru 1961

Buick	Cougar	Dart	Imperial	Olds F-85
Buick Special	Corvette	Dr. Bob's	Jag	Plymouth
Cadillac	Mustang	El Camino	Lancer	Pinto
Chevrolet	Mustang II	El Dorado	Karmann	Pontiac Tempest
Chrysler	Mustang II	Edsel	Lincoln	Rambler
Comet	Mustang II	Falcon	Mercury	Rambler American
Continental	Mustang II	Ford	Nash	Studebaker
Corvair	Mustang II	Hopson	Oldsmobile	Thunderbird

FREE 7-DAY TRIAL
Buy Now
Or Not Satisfied
Send for Money Refund

3,500,000 COPIES SOLD
PRAISED BY BEGINNER AND EXPERT
MECHANICS ALIKE...



JOHN D. STONE
Editor
MOTOR'S
New Auto
Repair
Manual



EDWARD R. HARRIS
Mechanic
MOTOR'S
New Auto
Repair
Manual



JOHN DEAN P.
Mechanic
MOTOR'S
New Auto
Repair
Manual

MAIL NOW FOR FREE TRIAL

Attach to postcard for fast action

MOTOR BOOK DEPT.

Desk 122, 230 W. 35th St., New York 19, N.Y.

Please mail the coupon to be sent a book on credit.

MOTOR'S New AUTO REPAIR MANUAL OK I
want to buy this book on credit and a
monthly payment of \$1.00 until my money
is paid off. Please send me a book on credit in 7 days.

MOTOR'S New TRUCK REPAIR MANUAL OK I
want to buy this book on credit and a
monthly payment of \$1.00 until my money
is paid off. Please send me a book on credit in 7 days.

Print Name _____

Age _____

Address _____

City _____

Zone _____ State _____

Check box and save 45¢ on postage and handling
for each book ordered. Add 45¢ for each book ordered
over \$1.00. Add 45¢ for each book ordered at 7 days.

WILL RESERVE YOUR 2½ ACRE TRACT IN SOUTH FLORIDA

COLLIER COUNTY . . . 50 MILES FROM MIAMI

Over 250,000 acres of this virgin land have been sold to smart investors. This land was, until recently, owned by a famous Florida family and was released to speed progress. There are no roads at present, no drainage, no clearing . . . as all land is in its virgin state. Nowhere in Florida can you invest so little and get so much and anticipate that one day, progress will demand your land for improvement or raw materials. SO ACT NOW WHILE THIS FABULOUS OFFER STANDS!

- NO INTEREST • NO CLOSING COST
- NO TAXES 'TIL PAID • NO OTHER COSTS

GOLDEN AGE INVESTMENT CO.
949 S.W. FIRST STREET
MIAMI, FLORIDA PS-2

Enclosed is deposit. Please reserve:

- | |
|--|
| 1½ ACRES, \$345, \$10 DOWN, \$15 MONTHLY |
| 2 ACRES, \$445, \$15 DOWN, \$15 MONTHLY |
| 10 ACRES, \$1,295, \$10 DOWN, \$25 MONTHLY |

NAME _____
(Please Print)

ADDRESS _____

CITY _____ ZONE _____ STATE _____

Please forward map showing location. If I notify you within 30 days
for any reason, my deposit will be returned without question.



30 DAY MONEY BACK GUARANTEE

EVERYBODY LIKES JOE ...until he starts to talk

MANY PEOPLE—without knowing it—cancel out most of their good points as soon as they speak . . . especially when they are trying hard to make a good impression.

You can avoid this kind of near-tragedy by using the tested, proved techniques of practically all interesting talkers. A brand new text, just out, called "Conversation Today," teaches you the easy, interesting and sure steps to success in everyday conversation.

Big 486-page volume contains more instruction material than correspondence courses costing ten times as much. Full price is only \$5.95 postpaid—or COD plus postage. Satisfaction or refund guaranteed.

Simply send this one-volume course back for full, immediate refund unless you find it the most helpful educational value you have ever seen! Order "Conversation Today" right now. Nelson-Hall Co., 210 S. Clinton St., Dept. 3BN-1, Chicago 6, Ill.

NO JOB WORRIES

PLASTIC INDUSTRIES 4001 23rd Ave. New York 56 N.Y.

IT'S Set You Up For Life In Your Own BIG-PAY SHOE BUSINESS

With The ONE Shoe Line That Serves
Everyone From Baby to "Pop" and "Mom"

Only 3 orders a day can make you up to \$50.00 a day, \$250.00 a week, \$10,000.00 a month. It is no trick at all to make big money full or Spare Time with America's most comfortable shoes. About 100 Spring Step's exclusive design styles. It is an actual demonstration. Over 240 styles for men, women, boys, girls and infants. Profits are BIG—repeat orders sure and easy. No experience needed. No Investment. Everything furnished free, including first class outfit and personal demonstrators! Send today for Free Offer.



Amazing 1-Minute
Demonstration
Does Your Selling
Job For You FAST!
I Give Producers
Their Own Shoes
AS A BONUS!

ORTHO-VENT SHOE CO. 512 Broad Road, Salem, Virginia

FREE!

TRIAL
LESSON



Trial lesson in

DRAFTING



LEARN AT HOME IN SPARE TIME

Check the want ads in any newspaper—SEE the big-pay opportunities open to you as a draftsman. What's more, you can learn this well-paid, prestige profession at home—quickly, easily! No special talent needed! Get complete, step-by-step Chicago Tech lessons in the mail, spend a few pleasant hours studying each week. In a short time you'll be a well-trained draftsman, ready to take your pick of many good jobs. Act now!

FREE INFORMATION—MAIL COUPON TODAY!

Get FREE TRIAL LESSON plus information about CTC practical training. Learn what successful Chicago Tech graduates say about high pay and opportunities in drafting. No charge or obligation.

Accredited National Home Study Council

CHICAGO TECHNICAL COLLEGE

B-231 Tech Bldg., 2000 So. Michigan Ave.
Chicago 16, Illinois

Mail me FREE lesson with information about big opportunities in DRAFTING.

Name _____ Age _____

Address _____

City _____ Zone... State _____

LIKE TO Draw?

Learn at Home in Spare Time...

EARN BIG MONEY

You don't need previous training or art ability with our Famous System of Manual Training. With this modern streamlined method, an entirely new concept in drawing, you learn rapidly, start to draw immediately without tedious study or exercise. WE SUPPLY EVERYTHING. As our student, you receive FREE of extra cost a big 16-page 1-color manual kit with all equipment and materials you need and valuable Artist's Articulated Model to help you draw any human pose FREE. Send TODAY for FREE FACTS on our Famous System of Manual Training.



AND COMMERCIAL ARTISTS EARN WHILE YOU LEARN

Magazines, newspapers, syndicated features, movies, TV ad agencies, all are searching for new cartoon and art ideas. As a successful Continental trained Artist your earnings are not limited. Many of our students start earning after first few lessons. A wonderful pastime too.

CONTINENTAL SCHOOLS, INC.

4201 S. Broadway, Los Angeles 37, Calif.



Continental Schools, Inc.
Dept. 114-2, 4201 S. Broadway,
Los Angeles 37, Calif.

Please rush me your Free Catalog and full information
book without cost or obligation. No salesman will call.

Name _____ Age _____

Address _____

City _____ Zone _____ State _____

Shrinks Hemorrhoids New Way Without Surgery Stops Itch—Relieves Pain

For the first time science has found a new healing substance with the astonishing ability to shrink hemorrhoids and to relieve pain—without surgery.

In case after case, while gently relieving pain, actual reduction (shrinkage) took place.

Most amazing of all—results were so thorough that sufferers made astonishing statements like "Piles have ceased to be a problem!"

The secret is a new healing substance (Bio-Dyne®)—discovery of a world-famous research institute.

This substance is now available in suppository or ointment form under the name Preparation H®. Ask for it at all drug counters.

LEARN WHILE YOU SLEEP!



Experiment in this fascinating, educational new field. Use your phone, recorder or amazing new "Electronic Educator" endless tape recorder. Free catalog lists over 200 unusual tapes, records, equipment for sleep-learning & hypnosis experimenters. Sleep-Learning Research Ass'n., Box 24K, Olympia, Wash.



BARBELLS

140-Pound CHROME DELUXE Barbell (Dumbbell) set only \$19.50. This is our feature set and is the best ever manufactured.

Training with adjustable weight is the EASIEST way to keep fit. The ONLY way to develop great strength and a perfect body. At the old and best equipped barrel company BTH gives value and prices no one can match.

BEND FOR FREE CATALOG.

BUR BARBELL CO.

Lynnhurst 3, New Jersey

WANTED!

Mechanically Inclined
Men to Qualify for
BIG PAY JOBS
AND SPECIAL FACTORY
TRAINING IN DIESEL



"We need qualified repairmen, operators, mechanics NOW!", say Diesel Manufacturers, Highway Builders, Truck Line Operators in every corner of America. Can you qualify for these High Pay Jobs? We can help you! Interstate's General Course and Cummins-approved Diesel home-training courses are internationally recognized. Advisory placement service for trainees. Don't wait. Men are needed NOW!

Get the Facts Today!

WRITE INTERSTATE TRAINING SERVICE

Dept. A-2, Portland 12, Oregon

Rush information on I.T.S. Diesel Courses, Special Factory Training and Diesel Job Opportunities.

Name _____

Address _____

City _____ Zone _____ State _____

The MOST COMPLETELY NEW and DIFFERENT AUTO REPAIR MANUAL



...in 20 years!

SIMPLIFIED! EASIER TO USE AND UNDERSTAND! Explains troubleshooting and repair so clearly that even beginners won't "miss".

Here is an entirely new and better car repair manual—one that doesn't leave you hanging half-way between confusion and guesswork on job procedures and details! Written by one of the nation's leading service technicians, GLENN'S MANUAL approaches each job from the standpoint of saving time and making things easy. It gives you every

bit of needed information clearly and concisely!

From simple tune-ups to complete overhauls . . . GLENN'S makes every step of the work amazingly clear . . . even if you've never fixed a car before. Covers practically any job on leading U.S. makes and models for the past 10 years. Includes foreign car tune-up specifications.

25,000 CAR REPAIR FACTS!
"Quick Guide" Troubleshooting Charts!
Weighs almost 4 pounds! Over 900 pages!
3,000 How-to-do-it Pictures!

GLENN'S helps you locate car trouble fast and surely—something most other manuals neglect entirely. Then you learn to make repairs, adjustments, and parts replacements in a jiffy.

Nothing is left to chance! No guesswork! No hunting through the manual to match up words with pictures. Everything is conveniently arranged. Indexes guide you swiftly to needed information. Step by step charts show how to proceed. Short cuts are explained, cautions pointed out.

Special photos of worn parts show how wear occurs; what parts to replace; which ones may be used again, and even what parts of various models are interchangeable. Manual covers service details on engines, fuel systems, electrical systems; transmissions, delivering power to the wheels, wheel suspensions, steering; braking, body mechanisms, power devices, air conditioners, etc. In short, GLENN'S is a complete down-to-earth repair manual for beginners—and a real time-saver, for experienced mechanics. Practice 10 days—at our risk.

--PRACTICE 7 DAYS FREE!--

Dept. PS-21, THE CHILTON CO.,
56th & Chestnut Sts., Philadelphia 39, Pa.

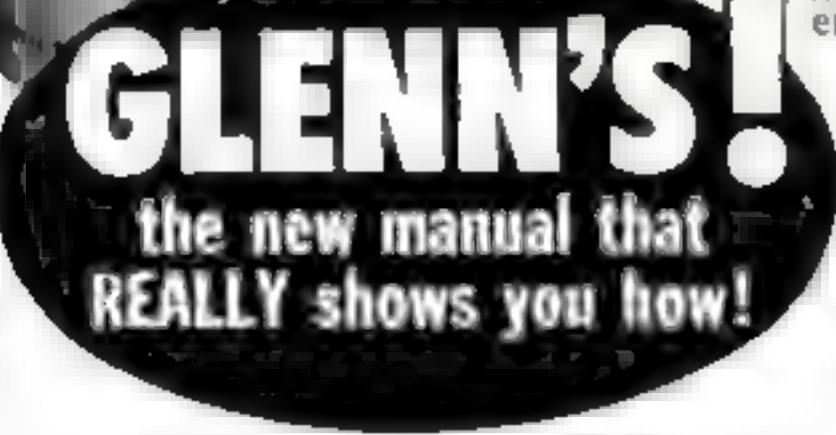
Send GLENN'S new 926-page Auto Repair Manual for 7 days FREE EXAMINATION. I will then remit \$3 in 7 days, pay \$1 a month later, and a final payment of \$1.95 (plus 45¢ postage) a month after that. Otherwise, I will return Manual postpaid.

SAVE 45¢ shipping charge! Send \$7.80 in full payment of Manual with order and Chilton pays for shipping. Money promptly refunded if you return book postpaid promptly after 7 days.

Name..... Age

Address.....

City, Zone, State



**Includes 68-page
TROUBLESHOOTING GUIDE!**



Other manuals tell how to handle car repairs—but overlook the most important step of all: HOW TO LOCATE WHAT IS WRONG WITH A CAR in the first place! GLENN'S Manual tells you! Hundreds of users say this big troubleshooting section is worth the price of the book! For instance, there are 6 reasons a clutch might slip, 9 reasons why it might drag, 7 reasons for noise and 11 for chattering. GLENN'S quickly helps you locate the exact one—not only on clutches but on other assemblies as well!

ABSOLUTELY FREE!

IN JUST
15 MINUTES
I'LL PROVE
I CAN GIVE
YOU A VIRILE,
RUGGED,

HE-MAN BODY!

In just 15 minutes, right in the privacy of your own room, through my TRIPLE-PROGRESSIVE COURSE, I'll strip pounds of steel-like muscles all over your body. I'll add 4 inches of power-packed muscles to your chest — another 3 inches of steel-packed muscles to your arms — I'll give you lifeguard shoulders and speedy, athletic legs. I'll also build inner strength and give you that virile look that men envy and women admire. LET ME PROVE AT MY OWN EXPENSE THAT EVERYTHING I SAY CAN BE DONE!

Send me this coupon and I will rush you my GIANT 48-PAGE COURSE that teaches you privately how you can become a real HE-MAN. DON'T MISS THIS ONCE-IN-A-LIFETIME OPPORTUNITY.

JOE WEIDER Dept. 100 21W
"Trainer of the Champions"
803 Palisade Avenue

Union City, New Jersey

Dear Joe:

Rush me my FREE POWER-PACKED MUSCLE COURSE. I am under no obligation, and I enclose 10¢ to cover handling and postage charges.

Name _____

Address _____

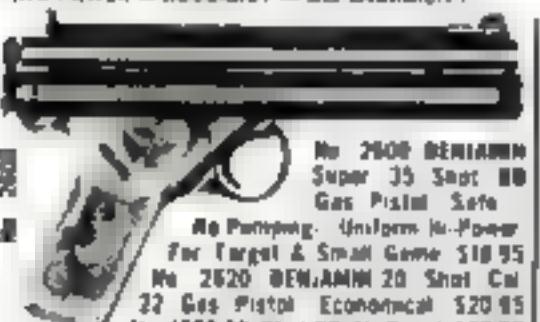
City _____ State _____ Age _____

In Canada Write Joe Weider 9475 Bloor Road, Montreal, Que.

AMAZING
FREE TRIAL
OFFER

STEP UP to BENJAMIN'S
DISCOVER the BIG DIFFERENCE
CRAFTSMANSHIP can Make in Your
SHOOTING PERFORMANCE and FUN!

25 MODELS SINGLE SHOT and REPEATERS
FIRST CHOICE of SHOOTERS who want SAFETY
CONVENIENCE - ECONOMY including HIGHEST
QUALITY MATERIALS to Assure Them OUTSTANDING
POWER - ACCURACY - DEPENDABILITY



No. 2800 BENJAMIN
Super 35 Shot .177
Gas Pistol Safe
No Pumping. Uniform Hi-Power
For Target & Small Game \$10.95

No. 2620 BENJAMIN 20 Shot Cal.
.22 Gas Pistol. Economical \$10.95

No. 1300 30 Shot BB Air Pistol \$12.95

No. 1320 BENJAMIN 35 Shot Cal. 22 Air Pistol \$12.95

FREE Catalog All Models Benjamin Single Shot & Repeaters—Cal. 177 or 22. Also, Special Hunting & Fishing Knives Other

BENJAMIN AIR RIFLE CO., 852 MARION ST., ST. LOUIS 4, MO.

You Can DEPEND on... BENJAMIN

TRADITIONAL
EXCELLENCE

MAT EXPERT

World Famous

AIR GUNS

and

CO₂ GUNS

\$6.95
\$6.95
\$6.95
\$6.95

No. 2800 BENJAMIN
Super 35 Shot BB Gas
Hillie Non-Toxic Safe
Convenient Uniform
Hi Velocity Power

No. 3620 BENJAMIN
Super 35 Shot Cal. 22
Gas Rifle \$21.95

No. 3100 Super 100
Shot BB Air Rifle Adj.
Screwing Power \$24.95

No. 3120 BENJAMIN
Super 35 Shot Cal. 22
Air Rifle \$24.95

No. 1300 30 Shot BB Air Pistol \$12.95

No. 1320 BENJAMIN 35 Shot Cal. 22 Air Pistol \$12.95

FREE Catalog All Models Benjamin Single Shot & Repeaters—Cal. 177 or 22. Also, Special Hunting & Fishing Knives Other

BENJAMIN AIR RIFLE CO., 852 MARION ST., ST. LOUIS 4, MO.

You Can DEPEND on... BENJAMIN

NEW!

INSTANT GLAMOUR

with

Realwood

Just Cut X And Glue



Real Hardwood Veneers

At half elegant, Real Hardwood Veneers! (not a cheap printed imitation) Finely sliced for maximum beauty, factory prefinished with tough vinyl. Water, dirt, paint, acids, fire and abrasion resistant. Washable.

"REALWOOD" fine hardwood veneers available on flexible sheets — for easy handling like leather!

MAGICALLY TURNS EYESORES INTO MASTERSPIECES

Covers everything. Wood, metal, plaster, stone, straight or curved surfaces — yes, even sharp corners!

UNLIMITED USES FOR HOME AND INDUSTRY: As a general covering material for metal and wood furniture, appliances, window displays, home decorating, and of course Wall Paneling. Just cut with scissors and paste.

LET YOUR IMAGINATION BE YOUR GUIDE

Send 25c today (refundable) for actual sample, full color swatch sheet of 8 available veneers and special discount price list for "Do It Yourselfers." Satisfaction Guaranteed.

FEDERATED PRODUCTS COMPANY
2315 Broadway, New York 24, N.Y.

"YOU ARE UNDER ARREST!"

Help Bring Crooks to Justice Through Scientific
CRIME DETECTION!

We have taught thousands this startling, profitable, pleasant profession. Let us teach you in your own home. Learn Finger Printing, Streamline Identification, Police Photography, Secret Service Methods. Thoroughly — quickly at small cost. Over 200 of the American bureaus of identification employ J.A.S. students or graduates. Write for "FBI's High Book of Crime," state

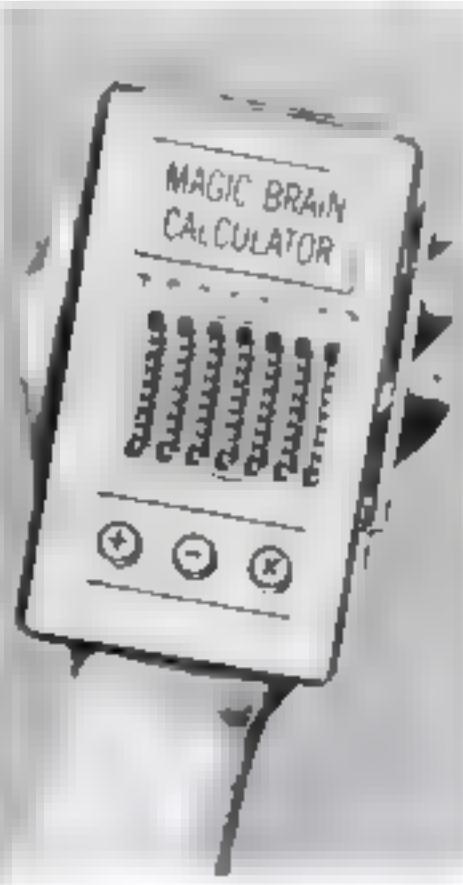
A Correspondence School Since 1919

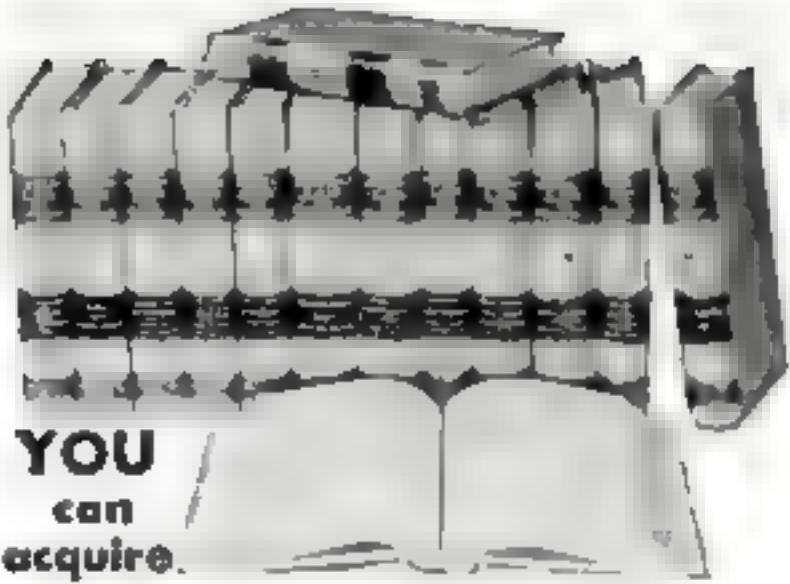
ACG

INSTITUTE OF APPLIED SCIENCE, 1920 S. Mayfield Ave., Dept. 1362, Chicago 40, Ill.

MAGIC BRAIN CALCULATOR NOW ONLY \$1

Pocket-size adding machine does all your math problems with ease. Adds - subtracts - multiplies to 99,999,999. MAGIC BRAIN CALCULATOR balances check books, adds grocery tapes, bridge scores, children's schoolwork, tax statements, car mileage. Gives you the answer in seconds. Simple to use... all steel mechanism works fast. For housewives, professional men, businessmen, students. Money back guarantee! MAGIC BRAINCALCULATOR, only \$1, postage paid. Sunset House, 434 Sunset Building, Beverly Hills, California.





**YOU
can
acquire.**

LAW AT HOME! EARN LL.B. DEGREE

Locally trained men win higher positions and bigger salaries in both business and public life. Greater opportunities now than ever before. We guide you step by step. You train in spare time. Degree of LL.B. We furnish all text materials, including valuable 14 volume Law Library, law notes, many terms. Get full details. Law Training for Leadership and Evidence books \$14.95 Bond \$10.00

Accredited Member National Home Study Council.

LAVALLE EXTENSION UNIVERSITY, 417 South Dearborn Street
A Correspondence Institution Dept. 243-L Chicago 3, Ill.

How to Make Money with Simple Cartoons

A book everyone who likes to draw should have. It is free; no obligation. Simply address

**FREE
BOOK**

CARTOONISTS' EXCHANGE
Dept. 192-D Pleasant Hill, Ohio

WT. 1/4 LB.
1 1/2" x 5 1/2" x 2 1/2"
PRISMS \$1.50

Made for U.S. Govt. for
pink per cent. of the
sky glasses. These
are made with a very
thin top. These
are made to order & other
sizes for home use. NEW
price \$1.50 for 1 1/2" x 5 1/2" x 2 1/2"
for \$1.00 or 1 for \$1.00
for \$1.00. Please put on my bill unless you add extra tax.
FRANK SALES, 3629 Sunset Blvd., Dept. P-261, Los Angeles 26, Calif.

It's EASY to be TALLER
Why be Average?

Now you can be dramatically taller! Amazing "ELEVATORS" shoes instantly add the all-important height you need to make you a BIG man; give you the boost you need to command everyone's respect. It's your secret because smartly-styled "ELEVATORS" look, feel like other fine shoes! Give yourself a lift. Mail coupon NOW for Free Style Booklet!

ELEVATORS
HEIGHT INCREASING SHOES
FOR PERSONAL FASHION

BROCKTON FOOTWEAR, INC.,
Dept. 1102B, BROCKTON 58, MASS.
Please send Free Booklet and name
of nearest dealer. I understand this
will be held in strict confidence and no salesman will call.

NAME _____

PLEASE PRINT

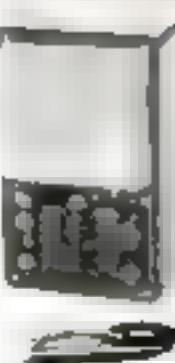
ADDRESS _____

CITY _____ STATE _____

AGE _____

SEND FOR FREE BOOK ON YOUR FUTURE IN THESE GROWING INDUSTRIES

ELECTRONICS TELEVISION RADIO

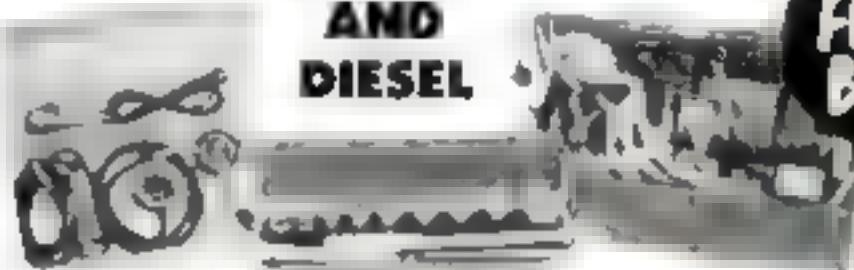


**FREE
BOOK**

More money... security... prestige... all yours in this
booming industry. Go into your own TV Service business
... into missiles, automation, industrial electronics, and
many other fields. Free book tells how thousands have
trained at home for a successful, secure future... how
you can earn as you learn. Send coupon now!

AUTO MECHANICS

**AND
DIESEL**



**FREE
BOOK**

Fast, Right, Easy... that's how National Technical Schools
trains you for top pay jobs in service and maintenance,
motor tune-up, diesel mechanics, foreign car service, and
many other fields. Training complete... industry recog-
nized, classroom developed, lab and shop tested. Send
for Free Book now. Clip coupon.

AIR CONDITIONING

**REFRIGERATION
ELECTRICAL APPLIANCES**



**FREE
BOOK**

Increase Your Earning Power... Master all three phases
in one low-cost course at home. Free book describes un-
limited opportunities, training methods and equipment
you get to keep. Course pays for itself in Spare-Time-
Income while training. Mail coupon now.



**ACCREDITED
MEMBER**



NATIONAL TECHNICAL SCHOOLS

4000 South Figueroa Street, Los Angeles 37, California

Phone: 213-481-1111 Telex: 222-7222

Select
one
of the
"Big 3"
now!

NATIONAL TECHNICAL SCHOOLS
World-Wide Training Since 1904

National Technical Schools Dept. C-31
4000 S. Figueroa St., Los Angeles 37, Calif.

Please mail FREE Book and Application checked
below. No obligation. No salesman will call.

Auto-Mechanics & Diesel Books

Air Conditioning, Refrigeration

& Electrical Appliances Book

Name _____

Age _____

Address _____

City _____

Zone _____ State _____

Check here if interested ONLY in Residential Training at L.A.

VETERANS Grade of discharge _____



LAVISHLY EQUIPPED 15 FT. ALUMINUM LAPSTRAKE RUNABOUT FOR \$635!*

Once again the 15 ft. Starcraft aluminum lapstrake Jet '61 is the biggest boating value available anywhere. The clean horizontal lapstrake lines bring the graceful contours of the boat into sharp focus. Lapstrake design also means a frisky, full-of-fun performance with up to 55 h.p. motors. Unitized hull and frame add amazing strength and banish annoying noises. This completely equipped Jet '61 is guaranteed 15 years against popped rivets and skin punctures. Write for color catalog.

*Plus freight and handling.

STAR CRAFT

STAR CRAFT BOAT COMPANY
Dept. PS-2 • Goshen, Indiana



Get Ahead Fast...with TOP PAY!

Learn to Operate Big Construction Equipment
Send for Free Personal Qualification Form Today

You can be one of America's high-pay operators of giant earth-moving equipment! Road building, irrigation, leveling, building erection and other exciting fields. Learn the EASY WAY by DOING! Operate our bulldozers, draglines, cranes, back-hoes, scrapers, graders, etc. Practical residence courses of 320 to 440 hours (depending on equipment chosen) give you the actual practice you need. You work with experts who show you how. Machines of major makes used. Budget Plan available. Ask about GI benefits.

Others do it, so can you! Act now! Write for free details and personal checkup form (no obligation).

NATIONAL SCHOOLS OF CONSTRUCTION, Inc.

10852 W. Wisconsin Ave., P. O. Box 192, Dept. S
Milwaukee 13, Wisconsin

**MAKE
Big
MONEY
WITH THE**

**Universal
LAWN MOWER
GRINDER!**

Enjoy a profitable lawn mower sharpening business. No previous experience needed. Place a hand or power mower on the Universal Grinder. With only one set-up you quickly grind the stationary blade and all of the reel blades to proper clearance without removing a single blade from mower.

Facts

G. Spurlock of Arkansas writes "I have had my Universal Grinder only two months. Live 1 1/2 miles from town. I've been already made a net profit of \$227."

J. L. Peterson of Pa. writes "Thank you for getting me started in this wonderful business. I averaged \$100.00 a week in May, and made \$1000.00 spent time this season."

Write TODAY for complete FREE FACTS about Big Money-Making opportunities in Lawn Mower Sharpening.

ROGERS MANUFACTURING CO., Dept. P 21, Lindsey, Ohio

**Locksmithing AND KEY
MAKING
Now Made Easy!**

Practical up-to-date course teaches you how to pick locks, decode, make master keys, repair locks, safes, etc. New self-instruction lessons for every beginner locksmith. Complete manual serves as station operator, mechanic, service station operator, gas & oil shop, hardware dealer, gunsmith. 28 easy illustrated lessons. Full price only \$5.00 postpaid; or \$4.00 plus postage. Satisfaction or refund guaranteed.

Nelson-Hall Co., Dept. BN-E
210 S. Clinton St., Chicago 6, Ill.

only AUTOMATIC TURNTABLE

**GARRARD
TYPE A**

COMBINE A DYNAMIC, SELF-BALANCED TONE ARM
FULL-SIZE PHONOGRAPH TURNTABLE AND WORLD'S
FIRST AUTOMATIC TURNTABLE IN ONE UNIT
\$69.50

Write GB-711, Garrard Sales Corp., Port Washington, N. Y.

REAL ESTATE

SAY BIG! SEND FOR FREE BIG, ILLUSTRATED CATALOG NOW! Graduates report making substantial incomes. Start and run your own business quickly. Men, women of all ages. Learn real estate. Course covers Sales, Property Management, Advertising, Loans, Mortgages, and related subjects. STUDY AT HOME or in classrooms in leading cities. No phone required. Write DIRECT for free book. No obligations.

Approved for World War II and Korean Veterans
WEAVER SCHOOL OF REAL ESTATE (Est. 1886)
20208 Grand Ave., Kansas City, Mo.

**FREE
BOOK
TELLS
NOW!**

RUPTURED

BE FREE FROM TRUSS SLAVERY

Surely you want to THROW AWAY TRUSSES FOREVER, be rid of Rupture Worries. Then Why Do you put up with wearing a gripping, chafing and unsanitary truss the balance of your life? If you do, it will NOT be through necessity but through choice on your part.

Now there is a new modern Non-Surgical treatment that is designed to permanently correct rupture. These Non-Surgical treatments are so certain, that a Lifetime Certificate of Assurance is given. Write today for our New FREE Book that gives facts that may save you painful, expensive surgery. Tells how non-surgically you may again work, live, play, love and enjoy life in the manner you desire. There is no obligation. Excelsior Medical Clinic, Dept. H6224, Excelsior Springs, Mo.

Study Programs in...

APPLIED SCIENCE AND ENGINEERING

Associate in Applied Science degrees — 2 years

Electronics Communications Technology
Electrical Power Technology
Computer Technology
Air Conditioning Technology
Industrial Technology
Metallurgical Technology

Bachelor of Science degrees — 4 years

Electrical Engineering
— Communications option
— Electrical power option
Mechanical Engineering

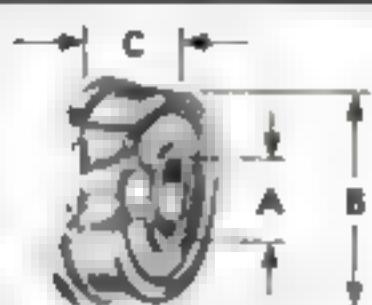
At MSOE, new classes begin quarterly.
Pre-technology program, scholarships, financial aid, and placement service available.

New! FREE "Your Career" booklet.
Send coupon today

MILWAUKEE SCHOOL OF ENGINEERING
1025 N. MILWAUKEE STREET • MILWAUKEE 1, WIS.

Hobbyists

REPLACE
HIGH-FRICTION BEARINGS
WITH
MINIATURE BALL BEARINGS



First Time Offered to Model Builders — Miniature Ball Bearings to take 3/32", 1/8", 3/16" or 1/4" shafts

Bearing Number	Dimensions		
	A	B	C
349	3 32"	5 16"	9 64"
159	1 8"	5 16"	9 64"
331	3 16"	3 8"	1 8"
1.3	4"	1 2"	3 16"

Reduce Power Loss! Increase Speed, Efficiency! Easy rotation — low friction — long life — lubricated — equipped with dirt shields also flange for easy installation. Titan • Atlas • Sidewinder and other missiles using millions of same bearings in Guidance and Control. \$4.00 ea postpaid. 24-Hour Mail Service. Use Order Form Today!

SHIP. ea \$3.59 ea \$3.31
ea \$1.59 ea \$1.13

Send \$4.00 for each bearing ordered

Name

Street

City

Zone _____

State _____

Enclose Check Money Order Amount .

ADDRESS: Dept. PS-3

NEW HAMPSHIRE BALL BEARINGS, INC.
PETERBOROUGH, N. H.



MILWAUKEE SCHOOL OF ENGINEERING

Dept. PS-261, 1025 N. Milwaukee St., Milwaukee 1, Wis.

Name _____ Age _____

Address _____

City _____ State _____

Course Interest _____

(Please Print)

LEARN UPHOLSTERY in your spare time run your own business AT HOME



FREE TOOLS WITH COURSE

BE YOUR OWN BOSS

Earn more from the start! Set up your own profitable business. In your own home enjoy steady income, independence or live in the exciting field of travel. It's not a get-rich-quick plan. Right off you start upholstering with top tools, complete frames, fabrics and materials included. FREE in N.Y. State approved U.S. Home Study Course. You learn skilled professional custom upholstering, repair, reupholster, restring, repair, how to make beautiful slipper chairs and draperies. EARN WHILE YOU LEARN in your spare time AT HOME the U.S. easy way.

FREE ILLUSTRATED BOOK FREE SAMPLE LESSON

Get ready for the good job and big profits with steady work in your own home running your own business. Mail coupon NOW for FREE BOOK Training in N.Y. State approved APPROVED FOR VETERAN TRAINING

UPHOLSTERY TRADES SCHOOL

Dept. PR 1610, 721 Broadway N.Y. N.Y.

Please send me FREE book Your New Way to a Successful career and FREE sample lesson No obligation, no cost to mail. Home Study Training in N.Y. School

Name _____ Please Print Plainly _____

Address _____

City _____ Check K-Cards Vets

PLUS
SLIP COVERS
Yours to Keep
or Sell

Gus Looks Into a Trunkful of Trouble

By Martin Bunn

BARRELING along on his way back to the Model Garage that Saturday morning, Stan Hicks, Gus Wilson's right-hand man, yawned contentedly as the wrecker's big engine hummed under his feet. Ahead a car was stopped, and Stan's throttle foot lifted instinctively as he approached.

Four men milled about the car's open trunk. At the sound of the wrecker, they turned almost as one. When Stan was still 50 yards away, they dropped the trunk lid.

It was an old gray sedan, with scabrous paint and battered fenders. All four men were unshaven. A party of hunters, Stan figured, from upstate.

"Hi!" he called. "Need any help?"

Four pairs of eyes studied him coldly.

"Not a thing, son," said one man.

Annoyed by the "son," Stan nevertheless added: "If you're out of gas, I've got a can with me."

A man with a bald head and hard blue eyes leaned on a fender, one hand in his pocket. He shook his head. "Got gas."

"Okay," said Stan. "Okay!"

He let in the clutch. Steady stares followed him as he moved off.

"Friendly guys!" muttered Stan, and turned on the radio the wrecker carried for highway and weather reports.

Music soon revived Stan's good spirits. But 10 minutes later it was interrupted by a breathless announcer.

"... The Bank of Evansville was broken into during the night, police disclosed early today, and robbed of a sizable sum in cash and negotiable securities. The exact loss was not revealed. Prime suspects are four men who fled a diner when a bulletin announcing the robbery came over the radio. Driving an old car with a hopped-up engine, they escaped police in a 90-m.p.h. chase. More news..."

"Holy smoke!" breathed Stan, and bore down on the throttle until he eased the



When they came out of the restaurant, Gus carried a big paper bag. The stranger's right hand was still ominously hidden.



- Standard 4 -

wrecker slowly into the Model Garage.

"How did it go?" asked Gus.

"Okay," muttered Stan. But as he went out to lock the gas pumps for one-o'clock closing, his mind mulled over the highway incident.

Should he tell the state police about it? What did he have, after all? Four men in a rattletrap car—there'd be plenty like them on the road this weekend. But few so downright unfriendly!

"Something on your mind, Stan?" asked Gus as he came back inside.

"Sort of," said Stan. "But it's like a miss in an engine—you can't be sure it's what you first think."

STAN left on foot, headed for the barber shop. He was waiting for the corner light when a bus stopped across the street. With a start Stan recognized the passenger getting off: the blue-eyed man from the stalled car.

The stranger entered the Model Garage, his right hand in his pocket.

Plagued by doubts, Stan stepped between two buildings and waited. Five minutes later, Gus and the stranger came out together—and entered the small restaurant down the street.

When they came out, Gus carried a big paper bag. The man was empty handed, his right hand still ominously hidden. They walked back to the garage and a minute later Gus drove off in his well-tuned coupe, the stranger beside him.

As they turned the corner, Stan made a dive for his elderly convertible. Retracing his road-call route, he caught up to Gus in 10 minutes—just as the gray jalopy fell in behind the coupe.

But about a mile farther on, the gray car's speed fell off, dropping to 40, 30, and finally 20 miles per hour. Stan fell back. When the two cars came to a full

stop, he hastily swung off where a shoulder of rock hid his car, got out, and looked ahead.

Five men, counting Gus, were huddled around the trunk of the old car. It was too far to see what they were doing. Then the trunk lid slammed, engines started up, and the cars were off. Soon, both turned in at a stone gateway.

"The old Marlow house," mused Stan, driving past. A hundred yards away he parked off the road, and cautiously approached the house. In the yard, hidden from the road, were both cars.

"This," thought Stan, "is where anybody with sense calls the cops."

Instead, he crouched behind a high hedge and peered through. The car's trunk was open again. Four men were bustling about it. Fascinated, Stan tried to ignore a small nagging worry. But suddenly it hit him hard: four men, and one was Gus!

"Hold it," a voice behind Stan barked. Stan turned—to see the missing fifth man. "Now stand up

and walk over to those cars."

The trunk was slammed shut as Stan walked over. Four men glared at him, only Gus's eyes crinkling above a grin.

"Did you go to the police, Stan?"

"No, I—gosh, Gus, do you know these guys? You helping them?"

"Told you a car was tailing us," put in a tall tow-haired man.

"It's okay," said Gus. "He won't talk."

Dismayed, Stan looked at the grim men and the old car.

"It's not what you think, Stan," Gus said. "I heard that news flash, too. But these fellows are no bank robbers. Meet Tim Hendricks. He went to school with me."

The bald, blue-eyed man extended his

Where'd it come from?



BEER is probably older than recorded history. Sumerian texts (from the beginning of the third millennium B.C.) already mention eight kinds of beer made from barley, eight from emmer (a variety of wheat), and three mixed brews. The all-important malting process was an even earlier process developed to improve the flavor of cereals.

The first brewers were women—whose prowess in the kitchen led them to discover the charms of fermentation.

exclusive AC buttress-top insulator



provides longer flashover path—
assures quick starts in all weather

AC Fire-Ring Spark Plugs offer a unique combination of features for finest car performance. Outstanding among these is the Buttress Top Insulator.

This exclusive AC design provides a longer flashover path for prevention of misfiring. Flashover is further retarded by the umbrella contour of the ribs that prevents formation of a continuous layer of dirt and grease. And

the umbrella contour holds the rubber covering boot firmly in place for added protection.

ACs give you sure starts in wet weather... best performance and economy in all weather. When it's time for your next 10,000-mile change, ask for AC Fire-Rings, the spark plugs that are original equipment on more new cars than any other brand.

AC SPARK PLUGS THE ELECTRONICS DIVISION OF GENERAL MOTORS



Fire-Ring spark plugs
They must be the best!

left hand. "Bunged up my other pushing a wrench this morning," he said, taking a bandaged fist from his pocket.

"Tim's a crackerjack machinist and a good practical engineer. He runs a shop in East Hardwick. Does a lot of experimental work," explained Gus. "Okay to show Stan?" he asked the men.

They nodded. Gus opened the trunk. Inside gleamed the finned, silvery bulk of an air-cooled engine.

"These fellows are test-driving a new aluminum engine they designed and Tim put together, Stan. It's secret—still not covered by patents."

"Makes us edgy," put in the man behind Stan, holding nothing more lethal

"It's set rich," explained Tow-Head around a hamburger. "Maybe that's why we burn so much gas on starts."

Gus looked up sharply. "What sort of weather does it conk out in?"

"Just like now. Cold, wet days. Not in that zero spell last week."

"That was dry cold," said Gus. He loosened the air-scoop clamp and started the engine. It galloped into life, ran steadily, and gradually grew rough. Gus fingered the automatic choke.

"Nothing stuck there," he said, and motioned to Stan to cut the engine. At once he lifted the scoop to peer into the carburetor throat. Stan saw a glint of white deep in the venturi

"Your new engine," announced Gus gravely, "has a very old complaint—icing."

As Stan looked puzzled, his boss explained. "Air rushing through there expands on the other side. Expansion cools it. If it's cold and wet to begin with, the water freezes out and chokes the venturi."

"Carburetor icing!" cried one of the men. "Gas-gulping starts, symptoms of overchoking, a mill that quits but runs again after block heat melts the ice."

The tow-headed man nodded. "We muffed all the

clues! Got so wrapped up in new problems we forgot to check out old ones."

"It's easy to fix, now we know," said Tim. "A warm-air duct should help. Gus, you did it again."

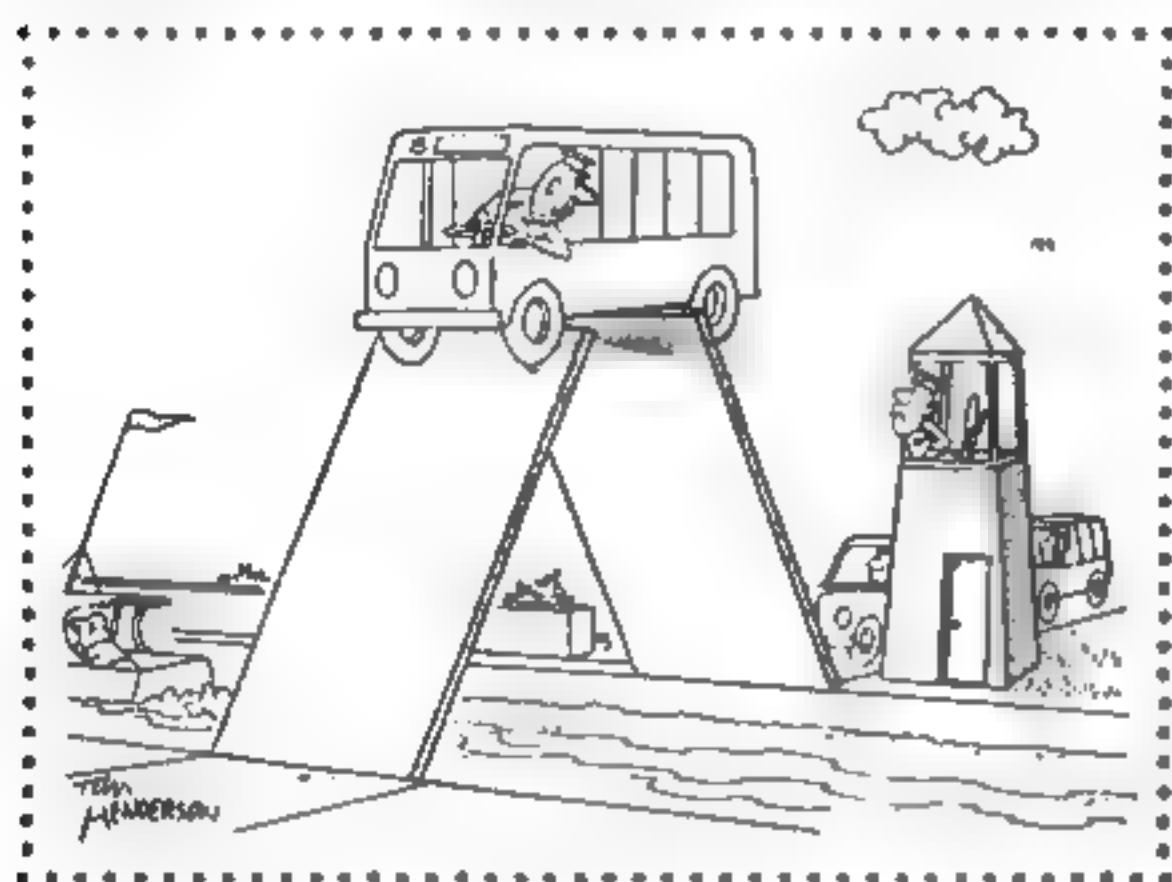
"We're mighty grateful," added the fourth man. "We'd begun to think this new engine was a lemon and we'd have to start all over."

"After a year's sweat and tears, too," groaned Tow-Heall.

"Luckily," said Gus, "things aren't always what we think. And that reminds me, Stan, we heard a spot bulletin while driving out."

"They caught the bank robbers in the hopped-up car?"

"Flat-footed. Their car was hopped up all right, but after that cop chase they got panicky. They forgot that it wouldn't run without gas."



than a meerschaum pipe. "Anyway, maybe we haven't anything to be secret about. Engine's got a weird bug that has us stymied."

"It loses power," put in Tim. "Quits, then cures itself after standing a bit. We didn't dare risk stalling in town. But seeing the name on your wrecker reminded me how Gus could lick hidden bugs, so I brought him out."

"Along with eats," added Gus. "They worked half the night tearing down the engine in a barn. Pitch in!" he ended, lifting a stuffed paper bag onto the fender of the car.

WHILE four tired men wolfed hamburgers and coffee, Gus and Stan studied the strange V-six engine.

"Offset carburetor," muttered Gus. "Could starve the end cylinders."

Quick starts in all kinds of weather... dependable operation at all speeds... with a Stewart-Warner Electric Fuel Pump. No more hot weather vapor lock or hard starting even when the temperature's way down.

The quality-engineered Model 240-A features an automatic pressure regulator. It automatically maintains desired pressure at carburetor from 1 psi to 8 psi, delivers up to 60 gallons per hour. A built-in fuel filter eliminates need for any other filter in the fuel system.

The popular Model 220 finds wide use where delivery requirements do not exceed 20 gallons per hour and pressure requirements are not critical. Efficient, trouble-free. Stewart-Warner Electric Fuel Pumps available in 6 and 12-volt types for any gasoline engine.

See your local Stewart-Warner dealer. He can recommend the correct Stewart-Warner Electric Fuel Pump for your needs.



**INSTRUMENT DIVISION
STEWART-WARNER
CORPORATION**

Dept. AN-21, 1840 Divensy Parkway, Chicago 14, Ill.

IMPROVE ENGINE PERFORMANCE WITH A

Stewart-Warner ELECTRIC Fuel Pump

REVOLUTIONARY NEW DESIGN SAVES YOU \$20 TO \$40
4½" JOINTER & PLANER

NEVER BEFORE POSSIBLE AT SO LOW A PRICE

(shipped complete as shown)

NOW ONLY \$1995

SOLD DIRECT FROM FACTORY

Patents pending on revolutionary new engineering developments make this bargain possible. This is a power plane with all the features of machine tools costing 3 times OUR PRICE! It planes, rabbits, bevels, cuts, beveling and gluing joints; is so rugged and durable we guarantee it unconditionally for ten years.

SEE THESE QUALITY FEATURES

All cast iron and steel construction • Balanced steel cutter head • Hardened and ground knives • Precision ground cast iron tables • Rugged cast iron base • Table depth adjustable 0 to 18" • Cast fence with single action cam lock • Pot lift off aluminum guard • Big, full size—22" long • Shp. wt. 25 lbs. Order by Mail — Sold Direct From Factory to You

OUR 30TH YEAR SEND \$19.95 CHECK OR M.O.
SENT C.O.D. WITH \$3.00 DEPOSIT
(If not completely satisfied after ten days return for full refund.) Shipped express collect.

AMERICAN MACHINE & TOOL CO., INC.
ROYERSFORD 40, PENNSYLVANIA

ENGINEERING



University of California
Berkeley
California
1960
Engineering
Architectural
Drafting
Mechanical
Drafting
Structural
Drafting
Civil Engineering
Architecture

Select any one of the 16 Modern Engineering Courses listed below. ANY one of them will lead you to a Successful, Safe, and Secure Life-time Future.

BACHELOR OF SCIENCE DEGREE, 30 MONTHS

SAVE 2 YEARS' TIME

B.S. Degree Courses:

- Electronic Engineering
- Electrical Engineering
- Highway Engineering
- Mechanic Engineering
- Structural Engineering
- Civil Engineering
- Architecture

Diploma Courses:

- RADIO-TELEVISION
Plus Color TECHNICIAN
- Electronic Technician
- Industrial Electronic Tech.
- Die and Tool Design
- Architectural Drafting
- Mechanic Drafting
- Structural Drafting

Approved for Veterans

HEALD Engineering College

Ten Miles of Post, Dept. PS-261

San Francisco, California

NAME _____
STREET _____
CITY _____
STATE _____

NOW...YOU CAN INVEST IN FLORIDA'S "FAST-GROWTH" AREA!

Unusual opportunity to acquire prime, raw, undeveloped acreage in Florida's **SILVER CIRCLE** of the '60's heart of the nation's missile program and of Florida's mushrooming electronics industry!

1 1/4 - ACRE TRACTS, \$695

only \$5 DOWN, \$5 Monthly

Send no money - just write for FREE brochure!



Note the strategic location of
ORANGE COUNTY ACRES

midway between thriving Orlando and the gateway to Cape Canaveral

Firstamerica

development corporation dept. S2

1939 HARRISON ST., HOLLYWOOD, FLORIDA

Please send FREE brochure on Orange County Acres.

Name _____

Address _____

City _____

State _____

double your income with degree

A college education is a splendid investment! Important firms like Tri-State graduates... visit campus to interview seniors. Qualify faster here. Bachelor of Science Degree in 27 months in Electrical (Electronics or Power major), Mechanical, Aerautical, Chemical Civil Engineering. IN 36 MONTHS a B.S. in Business Administration (General Business, Accounting, Motor Transport Management majors). For earnest, capable students. Small classes. More professional class hours. Modernized buildings, well-equipped labs, new dorms. Moderate costs. Year-round operation. Enter March, June, September, January. Founded 1884. Write J. F. McCarthy, Director of Admissions for Catalog and "Your Career" Book.



TRI-STATE COLLEGE

321 College Avenue

Angola, Indiana

get into operating or repairing
EARTH MOVING EQUIPMENT

Men needed now for good paying jobs in building road and construction work. Learn operation & repair rebuilding of heavy road mats, very planes, bulldozers, earth movers, etc. Actual on the job training 3 to 4 1/2 week courses. Classes start every Monday. Enroll & get your free complete catalog and reservation facts. E.I.T.P. Approved for Veterans' V.R.C.

Greer

TECHNICAL INSTITUTE

Attn.: S.B. Hutch, Box 368, Bradwood, Ill.

FREE

MUSCLE BUILDING INFORMATION

Sensational New Methods

Less Time—Less Effort—Better results
BODY-TONE, Box 438 E., North Miami 61, Fla.

KIT BOATS

Boat Plans
Patterns
Frame Kits

KIT CATALOGS Over 50 Models. Pro-
fessional Boat Plans. Cruisers, Fish-
ing Boats, Sailboats, Canoes, etc.
Also, Boat Parts, Glass, Tools, etc.
Also, Information, Plans and
Patterns. Prefab Frame Kits—
Send for our RECOLORED CATALOG

CRAIG-CRAFT, Tonawanda 1M, N.Y.

**You Can Have a
HE-MAN VOICE**

Send today for FREE booklet "Voice
Power and Personal Power" by Eugene
Fruehlinger. Just send your name,
address and age. Mailed in dia-
stamped envelope. No obligation.

PREFECT VOICE INSTITUTE
211 S. Clark St., Room 201 Chicago 1, Ill.



EYE GLASSES by MAIL As low as 75¢

WRITE for FREE
CATALOG with 14
LENS SAMPLE CARD

Thousands of
Customers
For 11 Years



QUALITY READING — or BIFOCAL GLASSES for FAR and NEAR
Recommended for folks approximately
40 years or older who do not have astig-
matism or disease of the eye, and who
have difficulty reading or seeing far.

ADVANCE SPECTACLE CO. Inc., Dept. PS
537 So. DEARBORN ST. CHICAGO 5, ILLINOIS

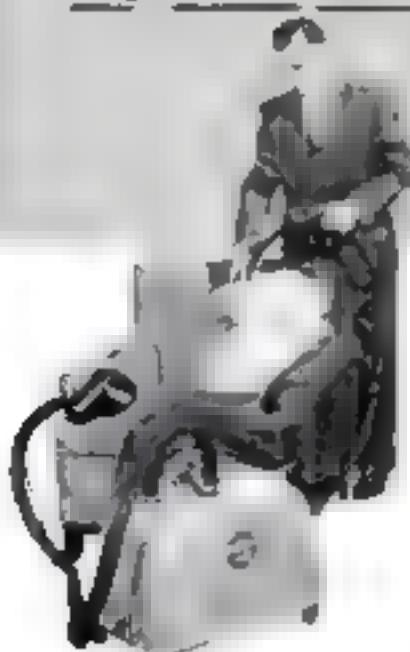
Learn at home the low cost Sweazey Way

Watch repairing pays up to \$6 an hour part time watch makers report on Survey. Unique and modern Sweazey home study System starts you making repairs right away on Swiss and American watches. Professionally prepared training. No previous experience needed. Special tools provided for practice. Tuition only \$5 a month. Diploma Awarded. Free sample lesson and opportunity book give all facts. Write today. No obligation.

CHICAGO SCHOOL OF WATCHMAKING
2330 N. Milwaukee Avenue, Dept. 421, Chicago 47, Illinois

Sicorn statement: From CHAS. LEMMING reads:

"After starting my own business



I've averaged

\$100

A DAY

—most of it clear profit!

Not everyone does as well... Mr. Lemming owns two machines

• In city of less than 50,000, Mr. Lemming started his own business after filing in coupon like one below. He averaged \$100 a day during first year, some days \$200. F. E. Doran grossed \$1050 in single month. Geo. Held grossed \$300 in one week.

How much you earn depends largely on you. No special skill, no large investment required for our electric upholstery cleaning machine. Start spare time until full time justified. Hire helpers as needed.

NO SHOP NECESSARY • You clean upholstered furniture on customers' premises—homes, hotels, motels, etc. Auto upholstering, too. No hauling; operate from your home. Watch business grow as satisfied customers tell friends. Supplies cost little, profits high.

If you want to be independent—free from layoffs, bosses—start profitable, year 'round business of your own. Own is not a lease proposition. You own the machine, you work when and where you please, and all the money you take in is your own.

FREE book tells exactly how to do it.

MAIL COUPON TODAY FOR FREE BOOK

VON SCHRADER MFG. CO.

211 "D" St., Racine, Wisconsin

Without obligation rush your FREE booklet about how I can start my own permanent, profitable electric Upholstery Cleaning business.

Name _____

Address _____

City _____ Zone _____ State _____

FULL-TIME SAW FILING BUSINESS

Built up in 8 Months by Married Couple

Dick and Jo Ann Koester sharpening hand and circular saws with their two Foley Saw Filers

They started in spare time with

one FOLEY SAW FILER

The Koesters started sharpening saws in spare time with a Foley Saw Filer, Retoother and Setter. Here's the story in their own words, 10 months later: "We have acquired another Foley Saw Filer and for the past two months we have been in full-time operation. As we live in a small town of 150 population in farm area we use our truck to pick up saws in five nearby towns. With a family to support and plans for building to our house we had to pick up business fast and already sharpen an average of 15-20 saws a day. Business for the future looks even better as good machine filing is our best advertising."



FREE BOOK "MONEY MAKING FACTS" shows just how you can start at home in spare time and sharpen hand, band and circular saws with the Foley Saw Filer. Small investment—time payments if desired. Get this booklet—study it! Send coupon today—no salesman will call on you.

FOLEY MFG. CO. 219-1 Foley Bldg., Minneapolis 18, Minn.

Send free book "Money Making Facts" and Time Payment Plan

Name _____

Address _____



... TURN CONCRETE INTO GOLD!

MOTOR
DRIVEN

BLT #1
New York City reports: "MY GENERAL BLOCK MACHINE PAID FOR ITSELF IN FIRST 2 WEEKS!"
Hundreds now in use the world over!
Write for FREE details today!

EXTRA

Book gives clear plans for 6 different concrete block buildings. Tells how to lay blocks, lay out building lines, mix concrete, build steps, porch and curtains. Plans all of great savings. Written by experts. Can save many times the cost of the machine! Get it now! No strings attached. Send \$1.

BOOK SENT FREE IF YOU BUY MACHINE.
\$1 REFUNDED IF YOU BUY LATER

GENERAL ENGINES CO.

DEPT. S-21

ROUTE 130, THOROFARNE, N.J.

I'LL FINANCE YOU

IN YOUR OWN
SCREEN PRINTING
BUSINESS

PRINT WITHOUT A PRINTING PRESS!

Amazing but true! The Screen Print is a simple inexpensive new expensive press and can be done in your own home, shop or kitchen, store room, garage! Easy! Fascinating!

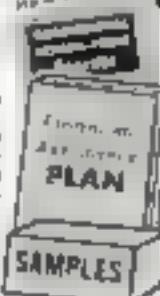
PRINT BEAUTIFUL SIGNS, POSTERS, BANNERS, FABRICS - anything in hundreds of colors. Use luminous new glowing fluorescent colors. Can be used for money. No Art ability needed - we supply everything.

HELP SUPPLY DEMAND IN YOUR AREA! Just about every kind of business - drug, department stores, hardware, liquor stores, gas stations, florists, jewelers, opticians, auto dealers, beauty shops, real estate offices, use Screen Printed things to increase business.

SOME \$100 JOBS USE LESS THAN \$10 WORTH OF MATERIALS You pocket the difference for your labor and know how. \$400.00 A WEEK EARNING'S POSSIBLE? Yes, write soon, but Mr. J. T. Anderson reports he earns over \$400.00 a week printing greeting cards, curtains, items of your choice. Get your share. Now! Mail Coupon Today!

FREE SAMPLES - MAIL COUPON NOW

MC Human Screen Print Co., 345 Broadway
Los Angeles 5, California, Dept. 12
Phone: DOW-1-1212
Address _____ Name _____
Age _____ Sex _____ Zone _____



HOME IMPORT BUSINESS

Transistor
Radio with
battery
\$3.95

12 Hour
Clock \$2.95

Surprise
Phone \$5.95

7 Day
Calendar
with clock \$1.35

**Men...Women...make
BIG PROFITS...** Buy dazzling
bargains abroad. Sell to friends,
stores or mail order. New Drop
Ship Plan puts you in direct
contact with overseas sources—
starts you full or spare time,
without product investment or
previous experience. Complete
details FREE. Write today!

MELLINGER CO., Dept. T242
1717 Westwood, Los Angeles 24, Calif.

...Plan shows
where you get
bargains like these
for big profit sales.
**DO NOT ORDER
FROM US**

MEN WANTED

Master a trade with a future learn
Auto-Diesel mechanics in our shop. You
learn with tools on real equipment. Earn
while you work. Many of our graduates
earn \$125 per week and up. No previous
experience necessary. Day and night
courses. Approved for veterans.

Earn \$125 Per
Week and up
**AUTO DIESEL
MECHANICS**

Write for free bulletin
AUTO DIESEL COLLEGE
7-8 7th Ave. H. Dept. 41
Harrisburg, Pa. Penn.

GET INTO ELECTRONICS

V.T.C. training leads to positions in technical field—electronics, medical, scientific, communications, etc. The graduate can compete in auto automation, liquid & advanced gases, in theory & practice. V.T.C. has been in operation since 1946. It is a member of ECPIA, a consortium of approved technical schools with major educational status. The Best Schools—Courses—IEE Graduate or equivalent. Catalog
VALPARAISO TECHNICAL INSTITUTE

DEPT. S VALPARAISO, INDIANA

LEARN FIBERGLASSING at Home in Spare Time

Interstate's complete home training course in Plastics Fabrication teaches fiberglassing, plastic molding, casting, laminating, internal carving, etc. Shows how to make hundreds of solo's art pieces of plastic. Profess and prepared special materials furnished. Send postcard for FREE booklet.

INTERSTATE TRAINING SERVICE
Dept. C-2, Portland 12, Oregon

RUPTURED?

TEST THIS TRUSS FREE FOR 30 DAYS



Wear a Web for strong support and
lasting relief of reducible inguinal
rupture. If not satisfied after 30-day
trial, purchase price refunded in full.
Write now for free book on rupture care.

WEB TRUSS Co. Dept. PS-2, Hagerstown, Md.



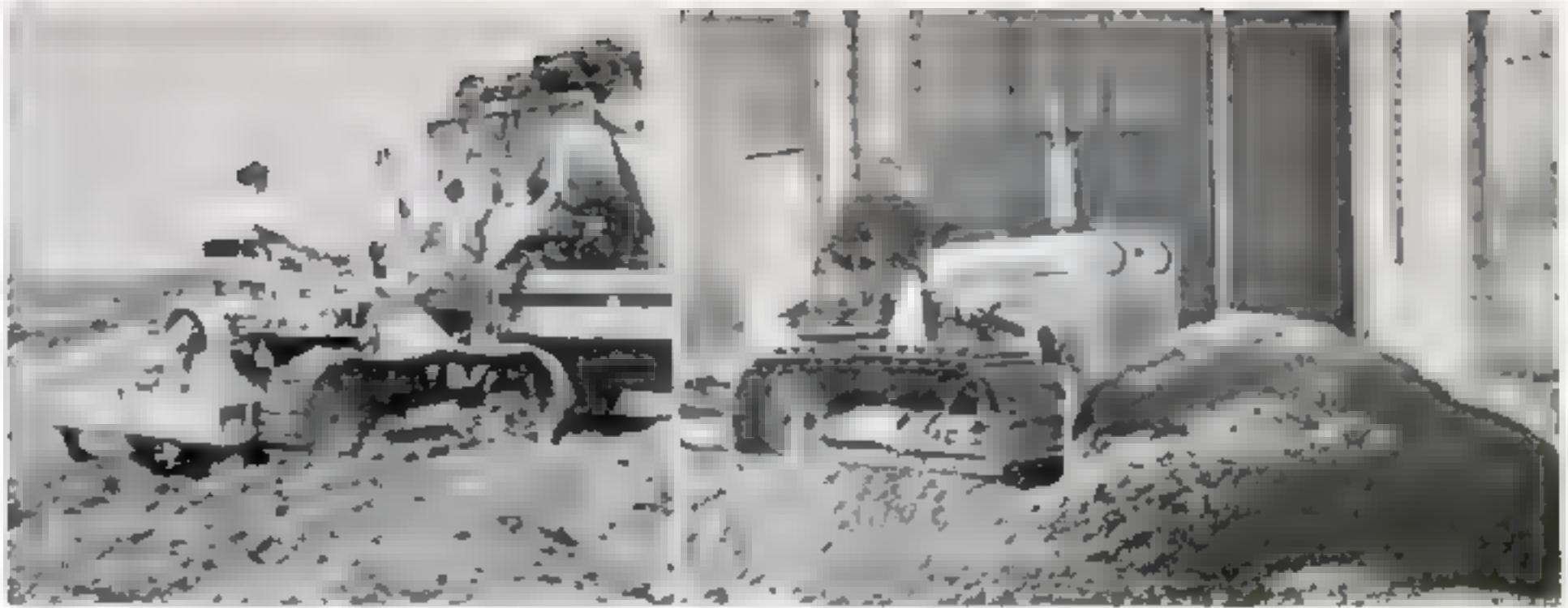
GRADUATE HIGH SCHOOL HOME

Free English Assignment

No classes to attend. Easy spare-time
training at home covers big choice of subjects. Many complete high school in two
years. Friendly instructors, standard
texts. Full credit for previous schooling.
Diploma awarded. If you have left school
and are 17 or over, write for FREE catalog!

Accredited Member, National Home Study Council
Wayne School of LaSalle Extension University

A Correspondence Institution
415 So. Dearborn, Dept. 223W, Chicago 6, Ill.



Profit from hundreds of nearby earthmoving jobs with this 47 hp economy-size crawler tractor

You can take on, at good profit, small yardage jobs within a few miles of home that owners of bigger, more costly rigs have to pass up. The International® T-340 is a rugged, four-cylinder gasoline or Diesel crawler built to big tractor standards, yet is compact and easy to move job-to-job. Operating costs are low so you can bid low

and get more jobs. A wide selection of matched equipment permits you to handle a broad range of high-profit work.

Write for free catalog, Dept. PS-2 Box 7333, Chicago 50, Ill.

INTERNATIONAL HARVESTER

15TH ANNIVERSARY SALE!
216 Different Stamps 25¢

What a Sale! Fantastic stamps from 15 years of imports: COLOMBIA - "Miss Universe" HUNGARY - Moon Rocket SPAIN - Bulletproof MONACO - Louvre diamond U.N. - Art stamp, FRANCE - Mystery Jet. You also get First Electronic stamp with graphite on back QUEMOY ANTARCTICA, many others. Grand Total 216 different.

SEND 25¢ TODAY. ASK FOR LOT #H-37
ZENITH CO. 81 Willoughby St., Ellyn 1, N.Y.



WOLVERINE GLOVES

8 FREE BIG ISSUES

TYPICAL VALUE
DIAL TELEPHONE \$7.93
No. PH-31
Standard phone company model.

We will send you a new issue every 6 weeks for a full year - NO CHARGE! Compare our World Famous Values.

- SEND FREE CATALOGS
 Send Dial Telephone @ \$7.93, plus postage

MAIL TO: OLSON ELECTRONICS
(Formerly Olson Radio)
517 S. Forge St., Akron 8, Ohio

NAME _____

ADDRESS _____

CITY _____ ZONE _____ STATE _____



LEARN TO EARN

HIGH WAGES

AS A HEAVY EQUIPMENT
OPERATOR OR MECHANIC

- WORLD'S ONLY CONTRACTOR OWNED AND OPERATED SCHOOL
- MODERN EQUIPMENT, HIGHLY QUALIFIED INSTRUCTORS
- V.A. APPROVED FOR GI TRAINING

Learn to operate bulldozers, draglines, cranes, back hoes, scrapers and motor graders **ON ACTUAL CONSTRUCTION PROJECTS!**

Learn by doing . . . no impractical correspondence courses.

WESTERN SCHOOL OF HEAVY EQUIPMENT OPERATION

Dept. F-12 Box 514
Weiser, Idaho Phone 910

WRITE TODAY
FOR FREE
SCHOOL
CATALOG



Member American Road Builders Association
Associate Member Associated General Contractors

NEW Improved Accurate Scope-Shot

Price Complete with 50 DISINTEGRATING PELLETS
They strike like a rifle when they hit—breaks much—pulls apart!
\$1.95

Big bag of 250 EXTRA Pellets 98c P.P.

World's First Precision SLINGSHOT
Scope-type sight
Militiam Solid Target No. D-12227
Pure gun rubber slings.
Beautifully polished cast aluminum stock.
Firgrip. So powerful it will shoot game. Fit pocket perfectly!
Guaranteed. **FREE** shooting manual
Order NOW from **GENERAL SPORTS**
4184-P2 Apple Street, Cincinnati 22, Ohio

Buy Old Briar today!

An excellent blend of fine domestic and imported tobaccos that give you rare flavor and superb aroma

Another fine product of United States Tobacco Company



NO-RISK 30 DAY OFFER PROVES YOU CAN MAKE HUGE PROFITS WITH NEW 5 YEAR LIGHT BULBS!

5

Part timers make \$100 a week. Full timers up to \$25,000 a year! Every home, store, office, factory or customer! Show how Sunmaster 5-Year Bulbs give better, softer, glare-free light. Guaranteed to outlast 10 to 13 ordinary bulbs. Customers save money—you make profits to 100% or more. Try our plan 30 days at our risk.

Write for **FREE Sales Kit.**

LIFE

Sunmaster Electric Products, Dept. PS-21
366 Fifth Ave., New York 1, N. Y.

Send **FREE Sales Kit and No-Risk Profit Plan.**

Name _____

Address _____

City _____

Zone _____ State _____

(In Canada, 539 King St. W., Toronto, Ont.)



BE YOUR OWN MUSIC TEACHER

Send For **FREE BOOK** Telling How
Easily You Can Learn Piano, Guitar,
Accordion, ANY Instrument This

EASY A-B-C Way



NOW IT'S EASY to learn music at home. No tiresome exercises. No teacher, just START RIGHT OUT playing simple pieces. Thousands now play who never thought they could. Our pictured lessons make it easy as A-B-C to learn to play popular, country music, hymns, folk songs, classical and any other music. On easy-pay plan, only a few cents a lesson. More than 1,000,000 students from all over the world.

The Course is step-by-step, foolproof. You read real notes—no "numbers" or trick music. Everything is in print and big pictures. First you are told what to do.

Then a picture shows you how. Soon you're reading and playing real sheet music. Your new ability will amaze people!



Stop Cheating Yourself of These Joys!

Popularity! New friends. Gay parties. Good times. Career. Extra Money. Understand, appreciate and converse about music. Learn lives and compositions of modern and great masters. Relax. Banish worries and frustrations. Satisfy self-expression, creative urge. Gain self-confidence.

MAIL COUPON FOR FREE BOOK

Find out why our course can teach you quickly, easily, inexpensively. Write for 36-page illustrated Free Book. No obligation. Mention your favorite instrument. Just mail coupon below today! No salesman will call.

New You Can
Learn Music In
Your Own Home

U. S. SCHOOL OF MUSIC Studio A152, Port Washington, N.Y.

Established 1898
Licensed by N. Y.
State Education Dept.

U. S. SCHOOL OF MUSIC Studio A152, Port Washington, N.Y.

Please send me your 36-page illustrated Free Book. No obligation; no salesman will call. I'm interested in playing: Instrument _____
Do you have instrument? Yes. No.

Name _____ (Please Print) Age _____

Address _____

City _____ Zone _____ State _____

Make a Fresh Start in Air Conditioning and Refrigeration—

Do you have a low-pay job with little security and no future? It's time you gave yourself a fresh start. Get into fast-growing Air Conditioning & Refrigeration, where 20,000 newly-trained mechanics are needed each year! Earn big money in a better job or go in business.

CTI offers a short-cut to success. Learn by practicing with real equipment. We send 25 kits of parts and tools to build a heavy-duty condensing unit. Make money as you train. Mail coupon for 2 free booklets.



COMMERCIAL TRADES INSTITUTE, Dept. R 841
1400 GREENLEAF AVENUE, CHICAGO 26, ILL.

Send booklet, *Success in Air Conditioning & Refrigeration*, and lesson samples. Both FREE.

Name _____ Age _____

Address _____

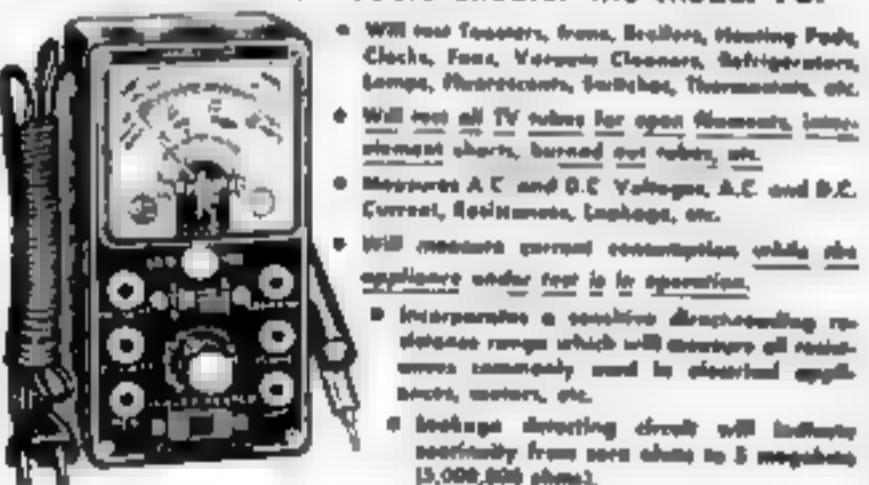
City _____ Zone _____ State _____

Accredited by National Home Study Council



Superior's New Model 70 UTILITY TESTER® FOR REPAIRING ALL ELECTRICAL APPLIANCES MOTORS • AUTOMOBILES • TV TUBES

As an electrical trouble shooter the Model 70:



- Will test Toasters, Irons, Blenders, Heating Pads, Clocks, Fans, Vacuum Cleaners, Refrigerators, Lamps, Fluorescents, Switches, Thermometers, etc.
- Will test all TV tubes for open elements, inter-element shorts, burned out tubes, etc.
- Measures A.C. and D.C. Voltages, A.C. and D.C. Current, Resistance, Capacitance, etc.
- Will measure current consumption while the appliance under test is in operation.
- Incorporates a sensitive diode-reading resistance range which will measure all resistances commonly used in electrical appliances, motors, etc.
- Leakage detecting circuit will indicate sensitivity from zero ohms to 5 megohms (10,000,000 ohms).

As an Automotive Tester the Model 70 will test:

- 6 Volt & 12 Volt Storage Batteries • Generators • Starters • Distributors • Ignition Coils • Regulators • Sockets • Circuit Breakers • Cigarette Lighters • Stop Lights • Condensers • Directional Signal Systems • All Lamps and Bulbs • Fans • Heating Systems • Motors • Also, will locate poor grounds, breaks in wiring, poor connections, etc.

Model 70 comes complete including 64 page book, only \$15.95

SHIPPED ON APPROVAL NO MONEY WITH ORDER — NO C.O.D.

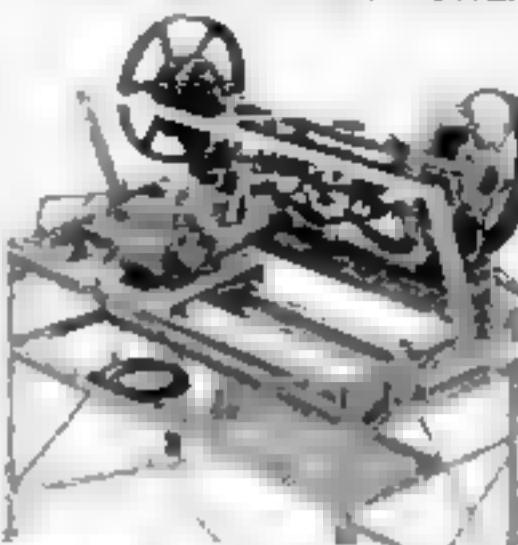
Try it for 15 days before you pay. If completely satisfied then send \$15.95 and we'll refund it plus a sum of \$4.00 per month for 6 months — by return air mail. **Guaranteed**: If not completely satisfied, return it in one week.

ROSS ELECTRONIC, INC.
Dept. D-853 2849 Tonawanda Ave., New York 34, N.Y.
Please send Model 70, 22 accessories, 64-page book on terms specified. Otherwise I will return tester.

Name _____
Address _____
City _____ State _____ Zip _____
Phone No. _____

MAKE EXTRA CASH

SHARPENING LAWN MOWERS THE MODERN WAY



Start your own shop! Fall or spare time. Earn many dollars in a short time. Average \$5.00 per hour. Many mowers need sharpening. With MODERN'S Extra Heavy Duty LAWN MOWER SHARPENER AND BED KNIFE GRINDER you have 6 machines in one. All operations are done quickly and easily. You make money from the start. Write for free details.

MODERN MFG. CO.
168 N. Fair Oaks Ave. Dept. Pasadena, California 11-6



SUPER JU JITSU

Now get tough double quick! A course of instruction in the art of practicing and using the art of applying LIGHT-SIN-JU JITSU Super Ju Jitsu. By Doshimatsu. These amazing lessons show you how it's done in a big 114-page self-study course. The weapons are just your BARE HANDS—they can be used effectively if you know how and practice the art. Easy to learn, quick. Only \$12. Lesson course only \$3.95 (postpaid) net (less postage, satisfaction or your money back guaranteed). Order Super Ju Jitsu Course. Nelson Hall Co. 210 S. Clinton Dept. 846-1 Chicago 4, Ill.

MAKE MONEY! REPAIR HYDRAULIC JACKS



Earn While You Learn At Home

\$100 or \$50 on first full or part-time in the competition free field of Hydraulic Jack Repair. Millions of pick-up auto service stations, truckers, body shops, garages, home need servicing. We show you how easy step-by-step directions.

Write for Catalogue and Free Books Offer.

Institute of Hydraulic Jack Repair
P.O. BOX 817 • NEW YORK 16, N.Y.
A Correspondence School Accredited by N.J. Bd. of Ed.

LAW FREE BOOK

THE LAW TRAINED MAN

Write today for a FREE copy of illustrated law book, "THE LAW TRAINED MAN," which shows how to earn the professional Bachelor of Laws (LL.B.) degree through home study of the famous Blackstone Law Course. All necessary books and lessons provided. Moderate cost, reasonable monthly terms. Write for FREE law training book today.

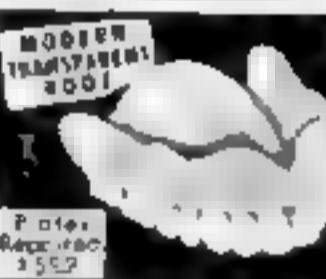
Blackstone School of Law, 307 N. Michigan Ave., Founded 1890 Dept. 122, Chicago 1, Illinois.



SOUND EFFECTS Hi-Fi and Super

Newest sounds: Airplanes, D.C.A., Electra Prop Jet, Boeing 707, Air Force F-104 Starfighter, Regulus I, Missile Launching, Carrier Sounds, Auto Acces, Music Trains, Household and Industry. More than 13 classifications over 1500 real life sound effects. See your dealer or send 25¢ for 36-page catalog containing more than 230 record listings.

MPTV SERVICES, Inc., 7000-H Santa Monica Bl., Hollywood 38, Cal.



Certified Dupont Plastic NEW FALSE PLATE

From 1 to 60 years old, age 1, age 60. IMPRESSIONS NEEDED. New, revolution denture. DuPont Plastic actually transforms your old, broken cracked denture plate into a new heat and pink Dupont Plastic Plate with same teeth or new natural teeth. DENTAL GO. ONLY \$18.95 NO MONEY DOWN, NO CREDIT CHECK, NO MONEY TO SPEND, NO MONEY TO PAY.

Only \$18.95

Dentist: **FREE: 6 months' supply False Plate Cleaner to all who write for our money saving offer.**

30-DAY MONEY BACK TRIAL

ALL STATE DENTAL LABORATORIES

Dept. 477

Chicago 2

FREE OFFER TO POPULAR SCIENCE READERS

MAIL THIS

Certificate
TODAY!

✓ START YOUR OWN
HOME BUSINESS
SPARE OR FULL TIME

MAKE UP TO \$10
AN HOUR—AT HOME
...WITH 50¢ WORTH OF

HIGH LIVING COST GOT YOU DOWN?
Want an extra \$10 or more as an extra monthly pay check for a few SPARE TIME hours? AT HOME? That's what I wanted a few years ago when I ran across an Old World formula for applying short cotton fibers to practically any surface so that it looked and felt like velvet or velour. **THE PROCESS AMAZED ME.** I spent several years of experimenting and developed the **NEW FLOCK & KRAFT MICRO-FLUFF** SYSTEM of applying short fibers of rayon, denim, flannel, or even cotton.

NO OVERHEAD, or Expensive Equipment You can start in your basement, garage, set up a pop-up or an easel table in bedroom. With an initial investment you can apply a few pennies worth of flock to flock fabric to a yard or two of other paper and make it look like \$1 a yard velvet for window displays in the newest stores, jeweler's boutiques, gift or department stores. Takes only minutes and little effort.

NELS IRWIN, Coast Industries, Dept. A-2, 15127 So. Broadway, Los Angeles 61, Calif.



MAL'S SPARK PLUG CLEANER

Not necessary to sand blast. Scrapes out carbon lead sediment and sand. Just twist and pull. Use on cars, motorboats, power tools & tractors. Made in three sizes for various sizes of electrode plugs. Give size name and number of plugs \$2.40 each + 75c

EMIL W. MALCHOW 4207 Cortland Lynwood California

ENGINEERING SCIENCE MATH

DEGREE IN
27 or 36 MOS.

B.S. DEGREE—36 MOS. • B.E. DEGREE—27 MOS.
Indiana Technical College
621 E. Washington Boulevard, Fort Wayne 2, Indiana
Please send me information on Bachelor's Degree Programs in Engineering and Science as checked below:

- Aeronautical Engineering
 Chemical Engineering
 Civil Engineering
 Electrical Engineering
 Electronic Engineering

- Mechanical Engineering
 Metalurgical Engineering
 Physics
 Chemistry
 Mathematics

Name _____

Address _____

FREE SAMPLE KIT AND PLAN * FREE
 NELS IRWIN, Coast Industries Dept. A-2
 15127 So. Broadway Los Angeles 61, Calif.
 Please return FFF & LF Home & Plan
 if not interested. No money
 or postage will be charged.
 NAME _____
 ADDRESS _____
 ZONE STATE _____

FREE SAMPLE KIT AND PLAN * FREE

MICRO-FLUFF!

I'LL SEND
YOU FREE
A MICRO-FLUFF
SAMPLE KIT AND
ILLUSTRATED PLAN

I'LL HELP YOU START RIGHT AWAY.
Since supervising dozens of my best dreams in my own FLOCK & KRAFT business, I have concentrated on helping you get started toward a successful future. My plan is designed to help you start at home, to make time and build gradually toward a full-time business if you wish. **START RIGHT NOW.** Fill out and mail the certificate at the top of this advertisement today. I'll rush you FREE a MICRO-FLUFF Sample Kit and illustrated Plan that shows you how to get started AT ONCE. I'll also arrange to send you the complete FLOCK & KRAFT MICRO-FLUFF outfit to try out right in your home without risk. Outfit includes fitting instructions, hundreds of show pieces, 16 trivets that take everything easy specially designed black velvet, Amadorite and green, our supply of FLOCK & KRAFT MICRO-FLUFF.

EVERYTHING YOU NEED TO START RIGHT AWAY. You've got nothing to invest—just \$10 down payment or nothing. **TODAY** by Attire, I'll show you how to **START MAKING MONEY AT HOME**.

FREE CATALOG INTERNATIONAL CRYSTAL MFG. CO. 18 NORTH LEE, OKLAHOMA CITY, OKLAHOMA



1961 CATALOG

- ◀ Commercial Crystals
- ◀ Amateur and Citizens Band Crystals
- ◀ Auto Radio Converters
- ◀ Oscillators
- ◀ Frequency Alignment Equipment
- ◀ Transmitters Modulators
- ◀ Transistor Subassemblies
- ◀ Citizens Band Transceivers
- ◀ Citizens Band Antennas and Accessories

SEND
FOR IT
TODAY

Send Free 1961 International Catalog

NAME ..

ADDRESS ..

CITY ..

STATE ..

EARN \$10,000 A YEAR

DIESEL
 AUTO

ELECTRONICS
 AUTOMATION

The average starting salary of students, completing our FCC License, Electronics Technician Course, and those completing our Diesel Automotive Training, is \$4,300 per year.

After becoming familiar with the industry, their salary usually increases to \$6,000 or \$7,000 per year.

After they become senior technicians, or master mechanics, they can earn \$8,000 to \$10,000 per year.

When they become specialists, or a part of management . . . or start their own business . . . they can earn considerably more.

RESIDENT SHOP TRAINING is easier and costs less than you may think! We provide you with housing and part-time jobs while in school, plus free nation-wide placement service for graduates.

Check subject above in which you are interested and mail for

Your future
in
ELECTRICALS
and
AUTOMATION



Veteran Approved
1626 S Grand, Rm. 50, St. Louis 4 Mo.

Name _____ Age _____
Street _____
Town _____ Zone _____ State _____

MY SPARE TIME HOBBY
MAKES ME
\$5.00 an hour
CASH PROFIT

—Grover Squires



START YOUR OWN SPARE TIME BUSINESS
You can turn your spare time into Big Cash Profits with your own **COMPLETE SHARPENING SHOP** . . . Grind saws, knives, scissors, skates, lawn mower blades . . . all cutting edges. Your Own Cash Business with no inventory . . . right at home . . . no experience needed.

FREE BOOK tells how you can start your own spare time business while you are still working at your regular job. Low Cost — time payments only \$15.00 a month. Send coupon today.

BELSAW SHARP-ALL CO., 701 Field Bldg., Kansas City 11, Mo.
Send Free Book "LIFETIME SECURITY". No obligation.

Name _____

Address _____

City _____

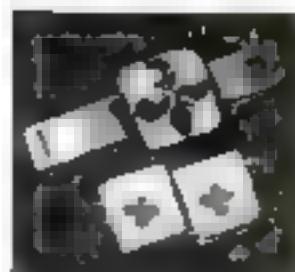
State _____



Real Pansy Embedded
In Castolite

EMBED REAL FLOWERS

IN CRYSTAL CLEAR CASTOLITE
FOR YOURSELF—FOR PROFIT



Make Flower Coasters, Key Tags, Jewelry, Figurines and many other articles. Embed real pansies, colorful leaves, beetles, sea shells, coins, photos, etc. Easy, inexpensive, profitable. For illustrated booklet showing how, mail 25¢ to Dept. B-2

The Castolite Company Woodstock, Ill.



A BODY LIKE MINE
IN SHORT TIME WITH FAMOUS
DAN LURIE BARBELLS!

SEND FOR FREE GIANT CATALOG

\$9.48

YORK Balance & D.L.D.
2645-52 Utica Ave., Dept. 1708 Brooklyn 34, N.Y.



DIAL TELEPHONE \$8.95!

Gov't surplus-factory reconditioned. Standard type with coil cord, complete with wire, fully guaranteed.

Add \$2.00 if 4 prong plug is required. Write for list. Shipments F.O.B.

SURPLUS SAVING CENTER
Waymart Dept. 2A1 Pennsylvania

INVENTORS NEEDED AT ONCE

If you have an invention you wish to sell outright or license on royalty, write at once. We are seeking inventions of household items, games, toys, sports equipment, tools and mechanical and technical devices. Patented or unpatented. For further information and free brochure outlining manufacturers' requirements, royalty rates, send your name and address (no drawings, please) to us by letter or on postcard at once.

KESSLER CORPORATION, Dept. D-72, Fremont, Ohio

FREE GUIDE Reveals 200 Ways to Make Extra Money

YOU can turn your spare hours into cash (\$20 to \$100 a week)! Ask for **Free Subscription to Opportunity Magazine**, nationwide guide to extra cash for millions of men and women. Contains hints, plans, hundreds of offers. No matter what your age, experience, or occupation—write TODAY for next & issue FREE. Send no money—just your name.

OPPORTUNITY, 850 N. Dearborn, Dept. 331 Chicago 10, IL

DEER HUNTERS!

RIFLESCOPE **\$9.95** ppd. inc. mount



CHOICE OF POWER: 2½X, 4X or 8X. Features coated precision optics throughout, color corrected, long eye relief, 3½" to 4" internal adjustment. Wide field: 40° at 100 yds = 21.5X U.S. Army. Easy to install. Fits over 350 U.S. & Foreign rifles makes Inst. Enfield ORDER NOW! Only \$9.95 ppd. incl. F.R.E. Mount. Send cash check or M.O. 100% security deposit. Add \$1 for airmail. Be sure to specify make & model of rifle plus indicate scope power for rifle scope. Immediate Delivery! Guaranteed Satisfaction!

PAN TECHNICS, LTD. 120 Pan Technics Bldg.

Encinitas 62, Calif.

Don't Spoil it KROIL it!



Don't ruin valuable equipment merely because some part is rusted tight. KROIL, the new chemical lubricant, creeps into minuscule inch spaces, dissolves rust and loosens frozen parts faster than any penetrating oil known. AT YOUR DEALER, 6 oz. spout can 65¢. **KANO LABS** Nashville 11, Tenn.

JOHN F. KENNEDY

was inaugurated on January 20th as the 35th President of the United States. You can have a most unusual and historic souvenir of his inauguration in the form of a beautifully engraved envelope showing the President's portrait and posted at Washington at the exact time of the ceremonies, inscribed with your own name and officially designated by the Post Office with a special postmark. It will be a constant reminder of this event in the momentous years ahead. Price \$1.00 each, but order early as quantity is limited. Money back if not thoroughly pleased. Ask for free lists of other historic Souvenir covers.

K. M. WALSH Box 308-B **Tuckahoe, N.Y.**

RUPTURE-EASER

FOR MEN, WOMEN AND CHILDREN

A strong firm belt, washable support for collective inguinal hernia. Back and front adjustable. Snaps up in front. Adjustable leg strap. Soft flat stretch pads. No metal or hard hard. I recommend for protection. A six week's after operation support. Three means are around one set part of abdomen. Specify right, left, side or double. We pay postage except C.O.D.s.



PIPER BRACE CO.
811 Wyandotte Dept. P-21 Kansas City 5, Mo.

PAGE FOR

TILLING
PLOWING
MOWING

A FULL LINE — 2 to 9 HP
with complete gear drive and reverse
FREE CATALOG • LOW PRICES • EAST TERMS
Over 40 years experience
OVER 60 ATTACHMENTS AVAILABLE!

PAGE Richfield 16
Wisconsin



DEALERS
WANTED

Want BIG PAY—
Your Own Business?

LOCKSMITH



You can quickly step into a well paid job or start a profitable business of your own. There are many opportunities every where spare time or full time.

EARN EXTRA MONEY FROM THE START!

All Special Tools, Supplies Furnished Free. Age 16 or over, minor 16-18 year old caps don't matter. In this you'll easily duplicate results. You earn fast at home gain practical experience through well illustrated lessons. You do real jobs under the personal guidance of experts.

ILLUSTRATED BOOK—FREE

For a future as your own boss or in a big pay job, send for THIS Illustrated book. No salesman will call. Only school of its kind. 100% State of N.J. Accredited. Not I Home Study Course. Vet Approved. Div. Tech Home Study Schools.

LOCKSMITHING INSTITUTE Dept. 202-1B
150 Park Avenue, E. Rutherford, N.J.

MAIL COUPON NOW

Locksmith Inst., Dept. 202-1B, 150 Park Avenue, E. Rutherford, N.J.
Please send FREE and without obligation Illustrated Book

Name _____

Address _____

City _____ Zone _____ State _____

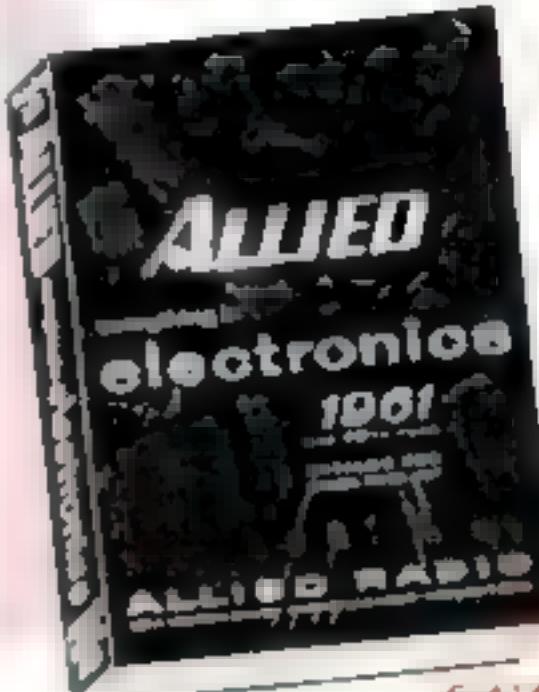
ALLIED

MONEY-SAVING 1961 ELECTRONICS CATALOG

444 PAGES

COMPLETE
UP-TO-DATE

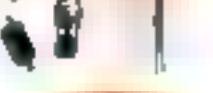
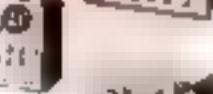
only \$2 down
on orders up to \$50;
only \$5 down up to
\$200; \$10 down
over \$200



SAVE MOST ON EVERYTHING IN ELECTRONICS

Send for this leading, value-packed catalog featuring everything in Electronics, including products available only from ALLIED. Whether you're a kit builder, experimenter, hi-fi fan, amateur, serviceman or engineer, you'll save most on:

- KNIGHT-KITS®—Best in Build-Your-Own
- Everything in Stereo High-Fidelity
- KNIGHT® Super-Value Stereo Hi-Fi
- Tape Recorders & Phone Equipment
- TV Tubes, Antennas, Accessories
- Parts, Tubes, Transistors
- Everything in Tools & Technical Books
- Amateur Station Equipment
- Citizen's Band 2-Way Radio
- Public Address & Paging Systems
- Latest Test & Lab Instruments



SAVE on everything in Electronics at ALLIED—get fastest shipment, expert personal help, easiest-pay terms, satisfaction guaranteed or your money back. Send coupon for FREE 1961 ALLIED Catalog.

YOU CAN DEPEND ON THE WORLD'S
LARGEST ELECTRONIC SUPPLY HOUSE

our 40th
year

ALLIED RADIO

ALLIED RADIO, Dept. 7-81

100 N. Western Ave., Chicago 10, Ill.

Rush FREE 1961 Allied Catalog No. 200

Name _____
PLEASE PRINT

City _____ Zone _____ State _____





BE A COMMERCIAL Artist

Learn Painting, Illustrating, Cartooning, Figure Drawing, Fashion, TV Art, etc. At Home, in Spare Time
All for only 20¢ a Day!

PREPARE for a fascinating profitable Art career this easy proven way. We supply TWO ARTIST OUTFITS at no extra cost! Our low-cost "teach-yourself" course includes all branches of art listed here. Cash in on demand for trained artists in advertising agencies, newspapers, magazines, TV stations, etc. Make good money part-time or full time. Be your own boss or high-pay staff artist.

ONE LOW-COST COURSE INCLUDES:
Oil and Water-color Painting
Commercial Art
Illustrating
Cartooning
Lettering
Fashion Drawing
Television Art
Landscape

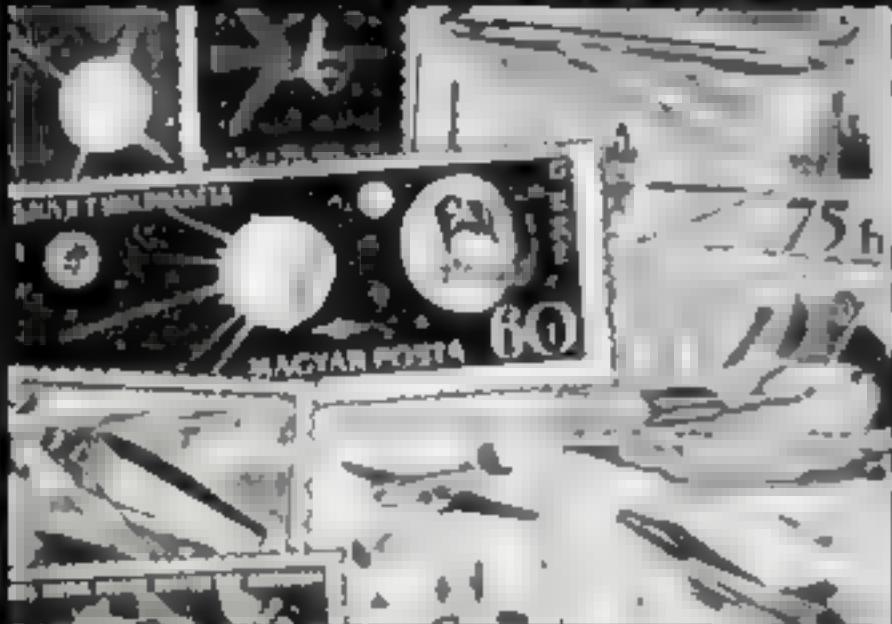
FREE BOOK describes our easy method. Send for it. No obligation. No salesman will call. Clip ad, fill in name, address and mail to Washington School of Art, Studio 152, Port Washington, N.Y. (Est. 1914—Licensed by N.Y. State Education Dept.)



Name _____

Address _____

FREE! AIRMAILS!



Fabulous collection of all-different genuine Airmail Stamps from remote corners of the world—Africa, Europe, Exotic Orient, everywhere! World's Largest Airmail, Flying Doctor Bomber, \$2.00 Helicopter, many others. PLUS Collection of Thrilling Space Age stamps . . . Sputniks, Jets, Fantastic Moon Rocket stamps. Both of these remarkable collections—containing stamps worth up to 25¢ each! — for only 10¢ to cover mailing costs. Extra: Other sensational stamps for your free examination, plus Big Bargain Catalog. Rush 10¢ today to

Jamestown Stamp Co., Dept. F21P, Jamestown, New York
RUSH my Free Airmail Collection and other offers.
I enclose 10¢ for mailing costs.
PLEASE PRINT

Name _____

Address _____
City & _____
State _____

NEW IDEAL 700 LAWNMOWER SHARPENER

with "Two-Way" Grinding Option means big volume and big profit for you!

Unit sharpens any reel-type mower either by "hook" or "straight-line" method—for top versatility. Gravity feed. Screw-type adjustments. $\frac{1}{2}$ h.p. motor. 6-inch grinding wheel. Includes: Bed-knife grinder, reconditioner and Tool Tray. Write today for full details!



The Fall-Roof-Heath Company, Dept. PS-2, Plymouth, Ohio

ALL FAMOUS BRANDS!

TIRES!

FARM TRUCK AUTO

GIVING NEVER LESS THAN 50% UP TO 70% OFF REG. PRICE!
HEADQUARTERS FOR ALL SPORT CAR TIRE SIZES
FREE—SEND FOR YOUR FREE CATALOG • FREE!

RELIABLE TIRE DIST., 120 Morgan Blvd., Carteret, N.J.

SIGN PAINTING

Home-Study Course—Only \$5.95
Teach yourself commercial sign painting and sign writing as it is being done TODAY in used to shops all over the country. Complete practical course for self-instruction. Shows latest methods of truck lettering, indoor and outdoor signs, reflecting signs, plus their special signs, gold leaf, alky screen printing, up-to-date alphabets, number-making, business information, etc.

SATISFACTION GUARANTEED OR REFUND given with all the satisfaction of a high-speed course or teacher on tap. Fox, 1960, only \$5.95 postpaid. Or F.O.B. plus postage. No risk—order today. Satisfaction or money back! Order "Sign Painting Course."

NELSON-HALL CO., 210 S. Clinton St., Dept. 200-1, Chicago 6, Ill.

MEN AND WOMEN WANTED—SPARE TIME
IT AIN'T SELLIN'—just serving. Take 20% R.M. fees
over YOUR AREA as our Service Distributor
for keeping retail stores supplied. Name
anywhere I only advertised 30-year old fine pays
you up to \$10 an hour for sample high
STORY. It's so simple. FREE write NOVO
855 Clark St., Ave Dept. 829, Chicago 11.
DESIGN

GOVERNMENT OIL LEASES LOW AS \$1 PER ACRE.

You do no drilling, pay no taxes, may realize a king-size profit without ever leaving home. Write for free map and literature.

AMERICAN OIL SCOUTS, Dept. PS
4350 Santa Monica Blvd., Los Angeles 46, Calif.

THE ORIGINAL PACKAGED

KITS

• World's Largest Line—New Fiberglas Hulls Over 200 ft. Hulls Kits Form Hulls, Seats & Covers Finished. All types—

Prima Cruisers, Fibreglas, Outboards, Easy

smooth results. Dealers Agents invited.

Send 25¢ for Colored Catalog

62 pg. Kit Catalog

ware and 8 pg. Advertising

(SPECIAL OFFER)

Colored Catalog

Boating Handbook

Send 25¢

CUSTOM • CRAFT

Buffalo 7, N.Y.



BOAT PLANS

PATTERNS FRAME PACS

• Over 400 Plans-Patterns, Frame Pak Kits, Framed Kayaks, Racers, Canoes, Catamarans, Cruisers, Inflatable (8' to 48') Wood, Plywood and Steel. Send 25¢ for 128 pg. Plan Catalog, Catalog plus "Boat Building Handbook" Send \$1.00

BASS FISHERMEN WILL SAY I'M CRAZY—until they try my method!

JUST ONE TRIAL WILL PROVE THAT I MAKE EVERY FISHERMAN'S DREAM COME TRUE!

I have no fishing tackle to sell, I make a good living out of my profession. But fishing is my hobby. And because of this hobby, I discovered a way to get those giant bass—even in waters most fishermen say are "fished out."

I don't spin, troll, cast or use any other method you ever heard of. Yet, without live or prepared bait, I can come home with a string of 5 and 6 pound beauties while a man twenty feet away won't even get a strike. You can learn my method in a few minutes. It is legal in every state. All the equipment you need costs less than a dollar and you can get it in any local store. The chances are no man who fishes your waters has ever used my method—or even heard of it. When you have tried it—just once—you'll realize what terrific bass fishing you've been missing.

Let me tell you about this method—and explain why I'm willing to let you try it for the whole fishing season without risking a single penny of your money. There is no charge for this information—now or any other time. But I guarantee that the facts I send you can get you started toward the greatest bass fishing you have ever known. Send me your name today—letter or postcard. You've got a real fishing thrill ahead of you. Eric P. Fare, Highland Park 35, Illinois.

PILES

If you suffer from the miseries of itching, bleeding or protruding piles, you may have a generous supply of Page's Palliative Pile Preparations

absolutely free for the asking. They have relieved pile suffering in hundreds and thousands of cases for more than 50 years.

FREE Trial supply to quickly prove all this, will be sent free and with no obligation to buy now or later. Send your name and address for your free trial, TODAY.

E. R. PAGE CO., Dept. 45R1, Marshall, Mich.

75 POWER TELESCOPE \$3.98

New 0-in-one telescope. 3 variable 25X-45X-75X magnification. 15mm lens. 25 power for clear, bright images. 45 & 75 power for long range. Guaranteed to bring distant stars, birds, sports, etc. 100% money back guarantee. Get yours now. CRITERION CO., Dept. 944-92, 331 Church St., Hartford, Conn.

DON'T PAY FOR THESE GREAT BOOTS!



GET THEM WITHOUT COST AS A REWARD -- PLUS THE CHANCE TO "BE BOSS" OF YOUR OWN \$10,000 A YEAR SHOE BUSINESS!

Brand new plan! You can earn marvelous new boots instead of paying for them... and develop an extra income for life!

Sell friends new Work, Dress, Casual Shoes and Boots in spare time. Amazing Vylit Sole guaranteed the life

of the shoe or boot or replaced FREE!

Also earn Advance Commissions up to \$5.00 a pair, plus big Bonus. No experience. Samples supplied. Write for new Selling Outfit — without obligation.

CHARLIE CHESTER SHOE MFG. CO.

Dept. S-119, Brockton, Mass.

RADIO SHACK CATALOG
FREE
One year's subscription to
RADIO SHACK'S
world-famous
Electronics
CATALOGS

See the most complete line of quality electronic equipment anywhere

Stereo • Hi-Fi • Tester Kits • Ham Radio • LP Records • Pre-recorded Tapes • Parts • Tools • Accessories

Order anything on Easiest Budget Terms take up to two years to pay

Receive fastest one-day service on every order; no troublesome delays.

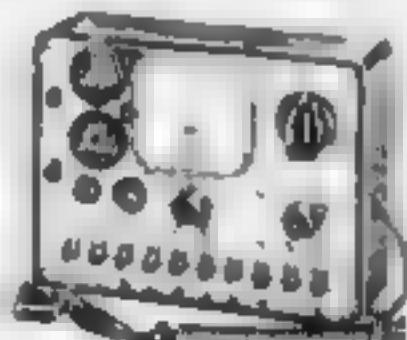
You must be satisfied or Radio Shack refunds your money in full

Compare this typical Radio Shack value

New Portable
Tube Checker Kit

\$14.80 \$2.00 down

Weights only 2 1/2 lbs. yet performs like larger test equipment! Tests radio, Hi-Fi, TV tubes for emission, shorts, leaks, opens, intermittents. Tube chart, operating manual included. No. 941002.



RADIO SHACK CORPORATION
730 Commonwealth Ave., Boston 17, Mass.

RADIO SHACK CORP. Dept. 6154
730 Commonwealth Ave., Boston 17 Massachusetts

Send latest Electronics Catalog plus
every new issue for one year, FREE.

Name _____

Address _____

Post Office or City _____

Zone _____ State _____

CUT-TO-FIT HOMES CUT COSTS UP TO 40%

Save labor cost up to 100%, reducing completed home cost up to 40%. You can assemble any of 57 designs from easy-to-follow plans. No measuring or cutting . . . every piece precision machine pre-cut and marked. **BUY DIRECT FROM MILL.** Eliminate all between overhead, profit and labor.

**PRICED FROM
\$2295 UP**

**CHOICE
OF
57
DESIGNS**

FIVE EASY-PAYMENT PLANS



INTERNATIONAL MILL & TIMBER CO. Bay City, Michigan, DEPT. PS21

AUTO MECHANICS

Experts say that "America needs 100,000 auto mechanics and 25,000 repair shops." Good jobs everywhere. Steady work. High pay plus opportunity to go in business. Train at home. Earn money spare time as you learn. Mechanic's tools and test instruments sent. Diesel or Body Rebuilding lessons included. Facts are free. Be sure to mail coupon today.



COMMERCIAL TRADES INSTITUTE
1400 GREENLEAF AVE. • CHICAGO 26, ILL.
A-101

Name _____ Age _____
Address _____
City _____ Zone _____ State _____

MAKE UP TO 2500% PROFIT! 100,000 ITEMS! DO PACKAGING at HOME for STORE DISPLAY RACKS

NO SELLING! All you do is package! Cash in on skyrocketing new "help-yourself" rack business! Package wanted items in see-thru bags at home! We show you how, help you step-by-step, supply materials. Our nationwide sales force places your products in stores and service racks. We show how and where to buy in bulk far below wholesale. Your profits are fantastic on products you package.



START SPARE TIME—LIVE ANYWHERE!

Get orders and deliver by mail! Live in city, town, farm. Start at home, spare time. Later, go full time, hire others. Simplest, fast-growing Home Business.

FREE "10-STEP PACKAGING PROFIT PLAN"

Reveals how to cash in on high-profit Home Packaging Business. FREE DETAILS. No obligation. Rush name & address to



WHITE HOME PACKAGING CO. — Dept. T242
2212 Jesse Street, Los Angeles 23, Calif.

costs. Nothing to plan or figure. Complete with all lumber, hardware, paint, nails, glass, roofing, etc. Sterling Home quality material throughout. Freight paid most areas.

Write today. Send 25¢ for illustrated, color catalog, floor plans and details.



PELLET FIRING

LUGER AUTOMATIC

- MAGAZINE LOADING CLIP
- OVER 15 MOVING PARTS
- FULLY AUTOMATIC

Automatic full size model of a Luger Automatic pistol — contains over 15 moving parts. Loads 8 complete rounds which shoot from the hard built magazine a 14.75" Free Bore shaped projectile. Has automatic slide action.

MOST AUTHENTIC MODEL GUN WE'VE EVER SEEN

comes to you with stock and parts to assemble to effectively pull together. It has complete supply of accessories and every part designed for the gun. Full Money Back Guarantee. \$198.00 postpaid. Mail order. Order by phone. From

HONOR HOUSE PROD. CORP., Dept. LB 46, Lynbrook, N.Y.

NOW YOU CAN GET MORE THAN HALF OF YOUR **VITAMINS** AT NO COST

YOU CAN NOW SAVE 3/4 TO 3/4 ON YOUR FAMILY VITAMINS. And HOW? Simply buy KOR-VAL vitamins. That's All.

TYPICAL VALUES:

	KOR-VAL COMPARABLE PRICE	MAT. BRAND (Fair Trade Price)
IMPROVED THERAPEUTIC FORMULA & B12	\$1.25	\$9.45
VITAMIN E 100 INT. UNITS (100 CAPS.)	\$2.25	

And there are dozens more values like that listed in Kor-Val's new exciting catalog. And you can be SURE you're getting the best your money can buy. Because...the government sets the standards for vitamins...for your protection. We set the price for your benefit. Kor-Val gives you everything you want in vitamin value...the utmost in quality any manufacturer can guarantee under strict government regulation. So SEND TODAY...now! for Kor-Val's FREE 32-page catalog. The values you can get only through E. J. Korvette, one of the NATION'S LARGEST CHAIN OF DEPARTMENT STORES. Send postcard with name and address NOW.

E. J. KORVETTE, 12 EAST 46 STREET, NEW YORK 17, N.Y.

Not everyone does as well, but T. N. COY, who started a business of his own, reports...

For 12 months I've averaged

\$800

**PER MONTH
INCOME**

—most of it clear profit for me!

Many men have discovered how to be independent, to be free of layoffs and booses. C. G. Naples grossed more than \$200 his first week. A father-son combination grossed \$44,000 their second year. H. Lemon says, "I netted \$1.33 in one 8-hour day."

How much you make depends largely on you. You need no special skill, no large investment. Start part time if you wish.

NO SHOP NECESSARY • Our Electric Detergent shampoos rugs, carpets right on floor—removes dirt and grime and helps to show their natural color and beauty. So efficient and safe it is used by largest railroads and hotels.

► *This is not a lease proposition. You own the machine, you work when and where you please and all the money you take in is your own. You take no risk. Machines fully guaranteed.*



MAIL COUPON TODAY FOR FREE BOOK

**VON SCHREIDER MFG. CO.
211 "R" Pl., Racine, Wisconsin**

Without obligation send me **FREE** booklet about your **RUG DETERGENT** and tell me how I can start my own permanent, profitable business.

Name _____

Address _____

City _____ Zone _____ State _____

ELECTRONICS

Train in the
new shop-labs of
the world famous



COYNE
ELECTRICAL SCHOOL
on a quarter of a million dollars worth
of equipment or learn at home in your
spare time with Coyne's modern tele-
vision training.

**Use this coupon to get our FREE BOOK
"GUIDE TO CAREERS"**

COYNE ELECTRICAL SCHOOL training training
1501 W. Congress Pkwy. at Coyne at home
Dept. of Electronics 51B, Chicago 7, Ill.

NAME _____

ADDRESS _____

CITY _____ STATE _____

Unlike most other schools, we do not employ salesmen

make it with 60c worth of sand & cement!

SELL IT FOR \$2000

every home a prospect for these "LIFETIME"

**CONCRETE
INCINERATORS**

Make big profits manufacturing rust proof, fire proof, almost indestructible concrete incinerators in your own back yard or garage — full or part time. Sell to home owners, hardware department and garden supply stores. Phila. manufacturer doing big volume with Sears Roebuck, large department stores. Easy to follow instructions and all needed equipment supplied. Exclusive protected franchise — No competition. Territories going fast. Write immediately for full details.

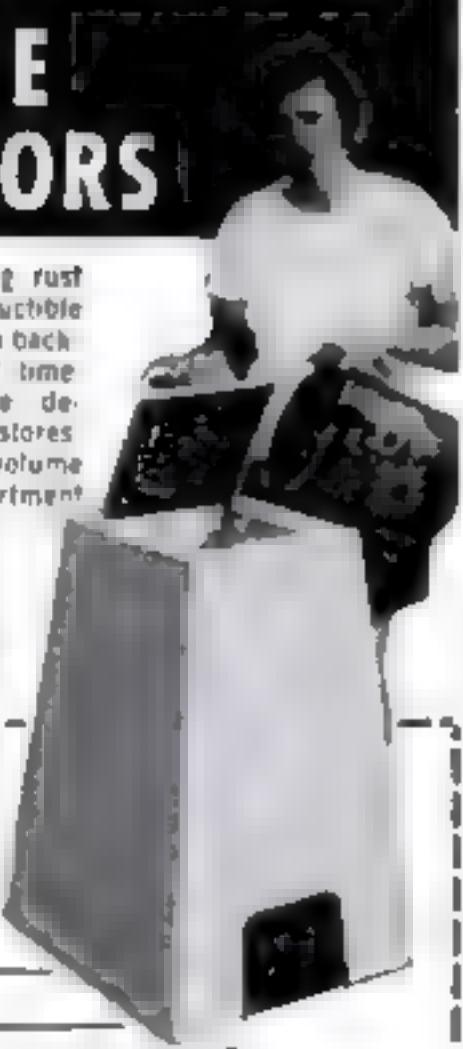
Dept. PS 261 T.C. TOR
318 Randolph Ave. Delanco, N.J.
Gentlemen

Rush full information about your
concrete incinerator protected
franchise offer

Name _____

Street No. or R.D. _____

City _____ Zone _____ State _____



Dr. Grabow

Pre-Smoked

PIPS

Only Dr. Grabow pipes
are mechanically pre-
smoked with fine
tobacco. Need no
breaking-in.
Sweet and cool
from the
first puff.

VISCOUNT

\$5.

Others to \$10.
Imported Brar

For Free Booklet Write:
Dr. Grabow Pre-Smoked
Pipes • Greensboro, N.C.

1959 MODELS IN ORIGINAL CARTONS

Brand new! Not seconds! Not damaged!

8" TILT ARBOR POWER SAW

SOLD DIRECT
FACTORY-
TO-YOU

Heavy duty all cast iron
and steel construction.
Shpg. wt. 25 lbs. Precision
ground cast table.
Massive cast miter
gauge. Patented motor
drive fits any motor. Blade tilts, table stays level. Finger
tip adjustable depth cut 0" to 2 1/4". Cross cuts, bevels,
rips, cuts compound angles. These are brand new units
from unsold stock offered at bargain price. Carries
unconditional guarantee. If not completely delighted with
your bargain — FOR ANY REASON — return for money
back refund. All tools sent express collect. Send check
or M.O. \$2 deposit on C.O.D.'s. We reserve right to
refund money if stock is exhausted. Avoid disappointment.
Order right now!

AMERICAN MACHINE & TOOL CO.
ROYERSFORD 35, PA.

comp
os shown
less blade

NOW
\$9.95
FACTORY
PRICE

YOUR BOAT IS SAFE

with "PERMA-D" MOORING BARS

Small craft are safely, conveniently moored to docks with "Perma-D" Mooring Bars. Strong springs attach to bow and stern. Boat rides easily with waves yet never bumps or rubs dock. Bars are easily attached to dock . . . fold flat when not in use. "PERMA-D" METAL BRACKETS . . . offer a quick, low cost way to erect and take down a stronger dock without ever working in water! WRITE FOR CIRCULAR on "Perma-D" dock brackets, boat brackets, mooring bars, pontoon kit, canopy and spring board. Dealer inquiries invited.



"Perma-D" DIVISION • Central Machine Works Co.
1236 Central Avenue • Minneapolis 13, Minnesota

FALSE TEETH



New Plate Made From Your Old—
Returned AIR MAIL Same Day . . .

Send for FREE INFORMATION on
new professional method that gives you
light, comfortable, natural looking perfect fitting plate—
upper or lower. From your old one broken or a plate without an
impression. Work guaranteed. SEND NO MONEY just send name,
address, we'll ship free. Without obligation. Price if plates are broken
TRU-GRIFF DENTAL LAB., 127 N. Dearborn, Dept. G, Chicago 2

FREE
CATALOG



Send for
FREE
Wholesale
Catalog

MAKE YOUR OWN RODS AND LURES

The most complete and fully illustrated catalog of tools, rods, lures, spinners, etc., ever produced and
includes: rod building, fishing, lures, rod blanks, rod parts, reels, etc. Over 170 pages.

FINNYSPORTS 2161X Sports Bldg. Toledo 14, Ohio

CAROLINA COAST

\$4 DOWN; \$4.40 MONTH

buys large shady

HOMESITE (70 ft. x 150 ft.)

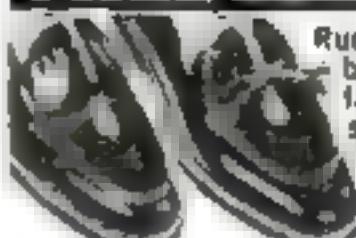
In beautiful BOILING SPRINGS LAKES
Satisfaction guaranteed. 16,000 acres. 82 fresh-water lakes.
Free literature.

CHARLIE PRATT, Southport 30, North Carolina

EXCLUSIVE DOUBLE-BEARING HEAVY DUTY PUMPS

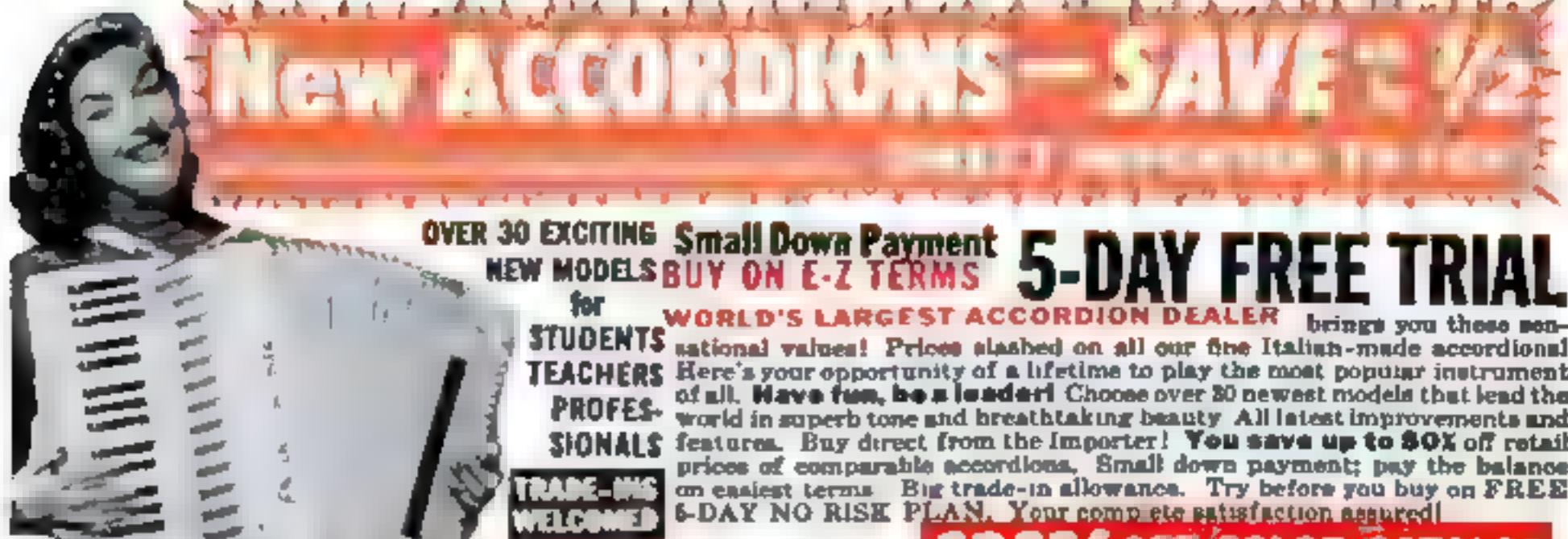
IRRIGATE & DRAIN & CIRCULATE & SPRAY
1/2" to 1 1/2" motor or larger. 1 HP for up to 6,000 G.P.M.
1/2" to 2" on shafts of 3,000 G.P.M. from 10' head. 1 1/2" to 3" on
1" out of shafts up to 1,000 G.P.M. TYPE A—3" all sizes
double bearings. TYPE B—Ball bearing model
TYPE C—Ball bearing model
Best for heavy driving
Postpaid if cash with order
Don't delay—send for power today!
MONET BACK GUARANTEE
Centrifugal and Gear Pumps in All Sizes
LABAWCO PUMPS, Bell Meadow 4, N.J.

FREE OUTFIT STARTS YOU IN BIG MONEY SHOE BUSINESS!



Run your own profitable "shoe store" business from home! Represent fast growing million dollar firm in spare or full time. We give you—
FREE—complete Starting Outfit that makes you \$217.00 EXTRA
each month for just 2 easy orders a day. You feature 195
fast-selling dress, sport, work shoe styles for men and women. Air-cushion soles, many other special features!
Sizes 2 1/2-15—widths AAAA to EEEE. Draw on 200,000 pair
stock. Also horsehide jackets. Start now selling to friends,
folks where you work. Rush postcard for FREE Outfit!

MASON SHOE, Dept. G-627, CHIPPEWA FALLS, WIS.



OVER 30 EXCITING Small Down Payment
NEW MODELS BUY ON E-Z TERMS

for
STUDENTS
TEACHERS
PROFESSIONALS

TRADE-IN'S
WELCOMED

LIFETIME
GUARANTEE

Your A.C.A. Accordion
is guaranteed against original
defects in workmanship
and materials for the
life of the instrument.
Parts and labor free.

FREE BONUS GIFTS

- for promptness . . .
- Easy to play music • Music Stand
- Name in chrome letters
- Deluxe Case • Music Portfolio
- Plus Other Valuable Gifts

Accordion Corporation of America

Dept. P-21 2003 W. Chicago Avenue, Chicago 22, Illinois

MAKE UP \$1,000⁰⁰ IN MONTH
with Sensational New Longer Burning
MERLITE LIGHT BULBS

Amazing FREE REPLACEMENT GUARANTEE!
NEVER AGAIN BUY LIGHT BULBS!

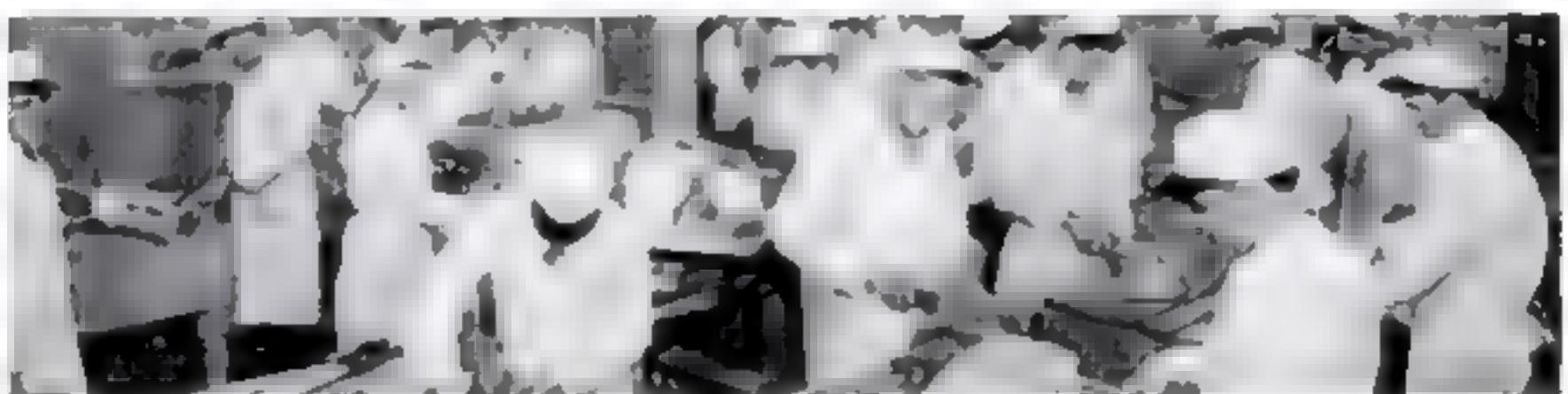


Average
\$12 an hour
The power
of tomorrow's
progress. Sub-
stantially less
to sell. You
work only
part time and
have average
\$12 an hour.
Philip Lamm,
Sales

FREE! Write now for complete details of
the biggest money making opportu-
nity in years. Everything \$12.00 no obligation.
MERLITE INDUSTRIES, INC., Dept. C 102,
Bulb Div., 324 E. 32nd Street, New York 18, N.Y.

LEARN MEAT CUTTING AT NATIONAL

Pay After Graduation



The steady dependable trade of Meat Cutting taught easily in 8 short weeks. YOU LEARN BY DOING under actual meat market conditions in big modern school at Toledo.

For beginners or men with experience. Get a profitable store of your own. Remember PEOPLE MUST EAT! Big pay jobs. Free employment help. Thousands of successful graduates.

Buying, cutting, percentage, pricing, advertising, selling, etc. A complete retail meat education. National School established 38 years. Get National training NOW. Pay your tuition in easy weekly payments

after you graduate. Send coupon for FREE school catalog—TODAY. G.I. approved.

National School of Meat Cutting, Inc.
Dept. 51-P, Toledo 4 Ohio

Send me your FREE school catalog on National Training in Meat Cutting, Meat Merchandising and Self Service Meats. No obligation. No salesman will call.

Name..... Age

Address.....

City..... State

Approved for Veterans



POCKET ADDING MACHINE

Adds, Subtracts to ONE BILLION!

Genuine GERMAN
Model with Korium
Steel Mechanism

Orig. \$3.98

\$100

PRICE REDUCED! Over 1,000,000 sold at
\$1.98 & \$2.98 now \$1. Add, subtract,
but no multiplication, but to ONE BILLION!
Korium Steel mechanism. Accurate 1/1000 in-
tensity. This is one half Wizard from West Ger-
many where \$1.50 is Supreme 1/1000 ac-
curate! Sold only by Thoresen.

FREE MAGIC RECKONER

Spells Magic Reckoner gives FIGURE. Use it to
multiply & divide in seconds w/o pencil or
paper. Rush \$1 for fast delivery anywhere
in U.S. or Canada. Add 10¢ postage for ma-
chines \$2 postpaid! Satisfaction guaranteed
or money back.

THORESEN, Inc., Dept. 7-B-888
525 Water Street, New York 2, N.Y.

ENGINEERING

HOME
STUDY
COURSES

Courses written by world authorities in all branches of engineering and science. Step-by-step instructions using methods proved successful by thousands of our graduates. One hour each day in your spare time will start you off to higher pay, security and prestige. Fill in the coupon to-day and indicate the course of interest. We will send you a complete outline of the course with a booklet describing the Institute and our advanced teaching methods.

CIVIL ENG.
INDUSTRIAL
ARCHITECTURE
FORESTRY
STRUCTURAL
MECHANICAL ENG.
INDUSTRIAL ENG.
REFRIGERATION
DRAFTING
ELECTRICAL ENG.
RADIO
ELECTRONICS
TELEVISION
AERONAUTICAL ENG.
HIGH SCHOOL
CHEMICAL
MATHEMATICS
ACCOUNTING

MAIL THE COUPON TODAY

Canadian Institute of Science & Technology Ltd.,
762 Century Bldg., 412, 5th St. N.W., Wash., D.C.

NAME _____

ADDRESS _____

CITY _____ STATE _____

COURSE OF INTEREST _____

Canadians: Send to C.I.S.T., 762 Gordon Bldg.,
263 Adelaide St. W., Toronto, Ont.

C.I.S.T.

FREE

**GIANT 1961
204 PAGE
CATALOG**

B-A 1961

A Complete Buying Guide for Everything in

**RADIO-TV
ELECTRONICS**

BURSTEIN-APPLEBEE CO.

Dept. PS, 1012 McGee St., Kansas City 6, Mo.

Send Free 1961 B-A Catalog No. 611

Name _____

Address _____

City _____ State _____

SEND
FOR IT
TODAY

MEN PAST 40

Afflicted With Bladder Trouble,
Pains in Back, Hips, Legs,
Nervousness, Tiredness.

If you have these troubles, particularly bladder trouble, then your condition may be traced to Glandular Inflammation—a constitutional disease. Neglect of this condition often leads to premature old age and sometimes incurable malignancy.

The Excelsior Medical Clinic has a New Free Book that tells how thousands of men have been successfully treated here at Excelsior Springs for Glandular Inflammation by NON-SURGICAL Methods. They found soothing relief and a new outlook in the future of life.

This Free Book may prove of utmost importance in your life. Write Today. There is no obligation.

Excelsior Medical Clinic Dept. B6220 Excelsior Spgs., Mo.

**STOP FRONT DRIVE DRAG
ON YOUR Jeep**



PROVEN IN OVER A BILLION
MILES OF SERVICE
Warn Hubs on your 4 w.d. give double-duty value—economical, free-
wheeling 2 w.d. (with added pep!), normal 4 w.d.—automatically with Lock-O-Matic, manually with Warn
Locking Hubs. See your 4 w.d. dealer.

WARN HUBS

WARN MFG. CO. Inc.
P.O. Box 6064 B
Seattle 68, Wash.

JEEP OWNERS

Re-Power Now with a V-8 or 6 Cyl engine—Use

Ford • Chevy • Mercury • GMC • Pontiac • Studebaker • Dodge or Plymouth
in Jeeps, Jeopatlers, B-16 Wgn., Trucks, Kaiser & M.J. cars, Con-
version kits \$43.25 to \$18.90. When fast action? Give us full informa-
tion and send \$1.00 dep. and we will ship correct kit. B&W Cab,
Send full amount for prepaid shipment. Wire, phone or write today.
Details FREE.

HOOSIER MACHINE PRODUCTS CO.

214 S.E. 6th St. Phone ORG-3443 Pendleton, Oregon

Be a
LOCKSMITH!
EARN WHILE
YOU LEARN
Send for
FREE BOOK

LOCKSMITHING INSTITUTE, Dept. 302-1, 150 Park Ave., E. Rutherford, N.J.
Licensed by State of N.J.
Vet Approved

New! AUTOMATIC ELECTRIC METAL CASTING SET

Automatic Electric Casting Set
as shown No. 6040-PS. Postpaid
Only \$12.00

3 Fig. Mold Set
No. 6092-PS. Postpaid
Only \$10.00

Electric Hand Casting Set Com-
plete No. 5710C-PS. Postpaid
Only \$10.00

Beginners Non-Electric Casting
Set No. 5704-PS. Postpaid
Only \$5.00

Union Infantry Casting
Set No. 6093-PS. Postpaid
Only \$12.00

3 Fig. Mold Only \$3.00 each
No. 6092-Confederate Sold-
iers

No. 6093-Union Infantry

Figures

Figures</

Magic Mail Plan-Make up to \$5 an Hour!



THIS
MAN...

In taking out
the mail he does his second job — or used to — for only
15 minutes a day. He picks
back \$1.50 each hour. On
average of making \$25.00
profit per hour of operation.

Get ORDERS and CASH from your mailman — do work in SPARE TIME at home — or expand into FULL TIME business. Sendou an order for the latest newest and most popular portable laminator. It's the easiest to learn and easiest to use machine ever made. It's the new Plastic Sealing & Plastic Laminating machine. It's the easiest to learn and easiest to use machine ever made. It's the new Magic Mail Plan car. It's the easiest to learn to go with cash in every check. No canvassing, no selling. We even

Get into PLASTIC LAMINATING at home

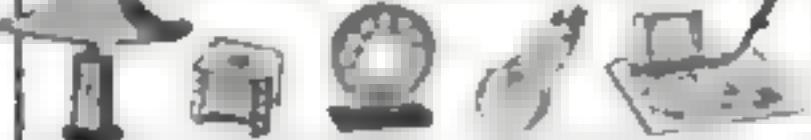
WELL EVEN
HELP FINANCE YOU

Send us the circled address slip to bring back cash and orders. \$1.50 per hour. Write and wire today and we'll send you a free catalog. Ask for our free brochure on how to start. No money up front.

Warner Electric Co. 1512 Jarvis Av. Dept. L 3-BN, Chicago 26, IL.

Make Thousands of Beautiful Art Creations

COSTUME JEWELRY • CIGARETTE BOXES
TRAYS • CANDLESTICKS • COASTERS
LAMP BASES • BOOK ENDS...ALL IN
SPARKLING COLORED PLASTIC



WARNER ELECTRIC CO. 1512 Jarvis Av.
Dept. L 3-BN, Chicago 26, IL.

A postcard form — use such for details and
mentioning your postage paid. No money up

Name _____

Address _____

City _____ State _____

If you take

Color Pix

8mm • 16mm • 35mm 127 • 128 • \$20

You must get our MONEY SAVING

Free Catalog

Listing all popular KODAK and ANSCO Film
Types and Sizes... WRITE TODAY!

SOLAR CINE PRODUCTS, Inc.

Distributed by Mail Film and
Processing Specialists for almost a quarter century! Dept. PSN

CHORD ORGANS SAVE $\frac{1}{2}$

Importer-to-You Prices
5 Day FREE Home Trial

Startling value and performance! Buy direct from
importer — amazing savings. Hand-crafted in Italy.
Anyone can play. E-Z Terms,
Bonus Gifts. Free Home
Trial. Money Back Guarantee.
Thousands bought and sold.
New Bond for color catalog,
low discount prices.



Play at Sight—
No Lessons Needed!

PHILHARMONIC ORGAN CORP., Dept. P-21
2001 W. Chicago Ave., Chicago 22, Illinois

Send color Catalog and the Bond for
NAME _____

ADDRESS _____ CITY & STATE _____ ZIP CODE _____

Many
have
done it
so
can you?



Stop being SKINNY like I was
Quickly GAIN 25 LBS. of
HANDSOME, POWER-PACKED MUSCLES like I did
Send for these 5 AMAZING PICTURE COURSES

At \$5 FREE before \$1 price goes back

1. How to GAIN MIGHTY ARMS
2. How to GAIN A BIG CHEST
3. How to GAIN A MIGHTY BACK
4. How to GAIN POWERFUL LEGS
5. How to GAIN A GRIP OF STEEL

Send 10¢ for postage for all 5 items.

Dept. PS-12, Great Neck, New York

Smarter Low-Cost Boating

Famous PORTABLE and FOLDING Yachts

Most seaworthy, all colors and sizes. 1 to 4 persons.
Executive line and high seas, SWIVEL seats. Candy
Chests, fishing, hunting, Use indoors, boats
Portables, 700 capacity. Cases, etc., etc.
PREFAB or Factory Finished in
all mobility forms.

BIG CRAFT
NOW ONLY

\$44
UP

PREFAB
SAIL BIG
\$9.95

89.95

Smart
SAFER

FOLBOT
ONLY 15-DOWN

WE WILL
SELL YOU
THE
BIGGEST
BOAT
FOR
THE
SMALLEST
PRICE

CATALOGUE

FREE

Ats in every
home or car

©
MAIL

coupon to:

101 FOLBOT CORP., P.O.
Charleston, S. C.

NAME _____

Address _____

City _____ State _____

Ford's Cardinal to Use V-4

THE various engines reported in previous columns as under development for Ford's compact-compact have been sorted out. Final choice is the narrow-angle V-4 mentioned here in August. It has a displacement of 108 cubic inches and puts out about 65 horses. It's water-cooled and has a cast-iron block.

Initially, this engine was made without a fan and the drive shaft extended forward, driving the front wheels. It persisted in overheating, however, and front-wheel-drive proved to be either too expensive or too troublesome.

To bypass these difficulties, Ford engineers went back to a more conventional design. They switched the engine end for end and added a normal cooling fan run off the drive shaft. (Earlier prototype engines had both electrically driven fans and weird arrangements in which the camshaft was extended with a fan bolted to its end.) The V-4, still hiding under a Saab hood for test purposes, will

drive the rear wheels on the 96-inch-wheelbase Cardinal when it has been hatched.

Ford's offer to buy complete control of Ford of England indicates that the Cardinal is to be a real international project.

Basic engineering of the automobile is being done right in Dearborn, but ultimate production will be scattered across the U. S., England, and the continent—the deciding factor as to which components will be produced where will be cost. Sales will be on a similar international basis; the car will be sold in this country, but all of Ford's eggs won't be in the domestic basket.

When will the fledgling leave the nest? Probably not before the 1962 new-car season, and it looks now as if the introduction might be even later. Too many loose ends are still hanging for the Cardinal to be nudged out in anything less than six months.

Cross ventilation. The stationary rear windows in the one-piece, lift-up tailgates of early Olds F-85 and Buick Special station wagons drew so much criticism that they were scrapped. Wag-

ons coming off the line for the past month or two all have roll-down windows as standard equipment. It costs more to build them this way, so \$27 has been tacked on to base prices.

Check those crankcase ventilators. Anti-smog crankcase ventilators being used on many 1961 cars need periodic maintenance, warn engineers from AC Spark Plug Division of GM. The valves in the positive ventilation systems, which route unburned hydrocarbons from the crankcase back into the engine to be burned during combustion, should be inspected at every oil-filter change—

or every 5,000 miles. They should be cleaned or changed every 10,000 miles or they will clog and fail to provide adequate air flow through the system.

AC has developed a test device to check the crankcase ventilators. It has an adapter plug that fits into the oil-filler or breather-cap opening. Condition of the system is revealed by color coding visible through windows in the tester.

Bigger wheels for small Buick. You can't leave customers hanging, so Buick recently announced its compact Special with 15-inch wheels instead of

the standard 13-inchers. The optional bigger wheels give customers in rural areas a bit over half an inch more ground clearance for rutted roads.

WHY ISN'T THIS SPARK PLUG CHROME PLATED



?

Almost everyone agrees. Autolite doesn't make the prettiest spark plugs in town. The new shiny kind are much more attractive. Obviously, there is a reason why these plugs are blue. The color itself doesn't make any difference. But it does tell you a lot about the way the spark plug is made. Example: The way the shell is sealed to the insulator. This seal guards against loss of compression, sluggish performance, poor fuel economy. In building its blue plugs Autolite seals the shell to the insulator under tremendous heat and

pressure. No plated shell could stand this treatment; it would crack, peel, discolor. Plated spark plugs are usually caulked with powder and the shell crimped to the insulator. Is this difference in sealing methods really this important? It is if you are an economy nut, or a performance nut, or just a guy who doesn't take chances on anything he buys for his car. Next time you need a new set of plugs, remember two things. For top performance and economy the color is blue, the name is Autolite Toledo 1, Ohio.



AUTOLITE

Fish Grab My Hook Without Caution ...Attack so ravenously...

I CATCH FISH LIKE CRAZY!

**My Secret is My French Patented Lure
That's GUARANTEED TO CATCH FISH
... or it costs you nothing.**

BY EMILE PLANES

(AS TOLD TO PAUL STAG)

Here is how I catch more fish than I ever caught in my life before. More fish than I ever dreamed of—and BIGGER fish than I ever suspected possible. Here is how you can catch bass, pike, perch, bream, trout, salmon, crappie, pickerel, walleyes and many, many other kinds of fresh water game and pan fish plus many salt water fish—the same way I do.

Since I invented my fishing lure, I catch so many fish, such BIG fish, and catch them so FAST people gather to watch me. I've been followed FOUR TIMES in ONE day by a fish warden to find out if my methods are legal. But my secret secret is my fishing lure that's GUARANTEED TO CATCH FISH—or it costs you nothing. Yes, GUARANTEED to catch fish even when other lures or even bait fails or no cost.

My lure works in lakes, ponds, streams, salt water where you time work money and disappointment is ideal for amateurs experts trolling casters shore fishermen. My lure catches fish differently from anything you've ever seen before in fresh and salt water. Even veteran U. S. fishing guides have been surprised at its astonishing catches. And the French Government itself has certified my lure by actual patent as UNIQUE.

An Underwater Discovery

I am a Frenchman, a science teacher, a skin diver and I have fished all my life. For years I have studied fish underwater—WHILE FISHERMEN ABOVE WATER were trying to catch them. What I discovered changed every idea I ever had about fishing and fishing lures.

Lures Can Frighten Fish Away

I watched UNDERWATER exactly how fish reacted to every lure, live bait, every fishing maneuver and trick used to catch them. I watched fish approach over the best performing lures, seem ABOUT TO STRIKE—then suddenly TURN AWAY. Something about even the best performing lures was obviously often KEEPING THEM FROM CATCHING fish. As for the average lure mostly they seemed actually to SCARE the fish—as though they looked in the fish as they looked to me UNDERWATER—shiny, painted bits of metal, plastic and wood. I saw live bait after it was cast turn white and die before my eyes—and saw fish often approach, prepare to strike—THEN TURN AWAY.



HOW VIVIF WORKS!

Fish have never seen anything like this lure before. It attracts fish by its vibrating tail. It is the world's most life-like lure in the water. Fish can't resist it—and when they grab the lure...feels lifelike doesn't warn them to spit it out before you can sink the hook in! Read this article and save the amazing story of this imported lure.

Minnows Irresistible

Then I saw the same fish approach toward the swimming minnows and without caution or suspicion STRIKE RAVENOUSLY. I saw the same fish that rejected the lures again and again attack without caution LIVE SWIMMING MINNOWS. In fact, these little minnows seemed to DRAW many fish from a distance—even before being seen.

Why Lures Often Fail

My talks with fish scientists and my own studies convinced me it was the swimming motion of minnows, particularly the writhing tail, that attracted many fish. I concluded that no lure I had ever used had SUFICIENTLY duplicated the living minnow and its motion.

How I asked myself could a fish lure be created that would attract fish just as the actual living swimming minnows did—and that once attracted would get the same ravenous STRIKE at live minnows WITHOUT the hesitation, suspicion and FEAR aroused by the lures I saw used?

My Man-Made "Minnow"

After 10 years of study and testing, I have finally created such a man-made minnow—so like a living, swimming minnow in shape, form, texture and motion that fish ravenously STRIKE—without caution—and I catch more fish, bigger fish—and faster than ever before in my life.

Because my man-made fish looks, acts, wriggles even "lives" like a minnow—bass, perch, pike, perch, trout and many other kinds of fresh and salt water fish attack ravenously—with out suspicion or fear—even when they're not being fed another fisherman on the lake.

Astonishing Catches Reported

I call my lure VIVIF. Once I perfected VIVIF I started selling them to other fishermen. Soon news of astonishing catches came in—from France—and from other countries.

Yes, from all over comes reports of amazing catches—of fish biting where other lures failed—or of the surprise, the simplicity, the effectiveness of this VIVIF lure. And what does this mean to you?

Simply this: Now YOU can get more out of fishing than ever before. Now YOU can catch more fish, bigger fish than ever in your life. It is GUARANTEED—or you pay not one penny. It means now no longer need you come back with an empty creel from a long day's fishing. It means no longer need you spend hours of work digging worms and catching minnows or other bait. It means you can save the endless expense of continually buying expensive spinners, flies, plugs, bait and lures. It means you can often catch the fish that are not biting on worms, bugs, plugs, spoons, canned bait, flies, cut bait or spinners or no cost. It means you can troll, cast or shore fish with my lure with equal success. It means you can go out after and come back with large mouth bass, small mouth bass, pike, pickerel, perch, bream, trout, walleyes, salmon, red tails, striped bass, blue fish, weak fish and do it time and again—or your money will be refunded at any time. VIVIF is catching fish in 25 countries for delighted fishermen. 1,050,000 VIVIF's have been grabbed up. Already reports from U. S. fishermen say VIVIF is the greatest lure they have ever used. I predict VIVIF will soon be the world's fastest selling fish lure. Don't let the magic power of VIVIF yourself without risking a penny.

VIVIF IS IMPORTED SUPPLIES ARE LIMITED

To get your VIVIF now, mail Amazing Trial Coupon. U. S. supplies are still limited. Order now so we can't wait to have your VIVIF in time for your next fishing trip. Only if you act at once can we guarantee to fill your order immediately. Don't delay.



THIS IS EMILE PLANES, Science Instructor, Skin Diver & diver, the man from Besancon, France who went underwater to find out why fish reject certain lures and hate others—and who in a series of real & observation research and dive power, I now created a lure to do this. He made it now that you can buy no fish on earth that holds an all-time fish record in Britain and has made amazing catches in this country and all over the world. Read on this page how you can buy this amazing minnow that's GUARANTEED TO CATCH FISH OR IT COSTS YOU NOTH NG!

AMAZING TRIAL OFFER

It took me 10 years of hard work developing, improving, and perfecting VIVIF to achieve my final result. But you can test the magic power of VIVIF yourself without risking a penny. VIVIF makes the best out of fishing, lets you have more fun out of fishing—because you catch more fish.

All you do is mail the no-risk trial coupon below. When you receive your VIVIF use it anywhere you like—to prove its fantastic fish catching power. Use it to catch bass, trout, perch, pickerel, pike, walleyes—any sport or pan fish you like to catch.

Put VIVIF to every test. If you don't agree it is the finest lure you've ever used—if it doesn't catch more fish and bigger fish, you have used it entirely free. It won't cost you a penny. Read amazing trial offer below.

Over 1,050,000 Amazing VIVIF's Already Sold Throughout The World. Be The First In Your Area To Do One.

Mail Amazing Trial Coupon Today

Hamilton Home Products Corp., Dept. 22-PS

Fishing Tackle Division

8 Kingsland Avenue, Harrison, New Jersey

Please send VIVIF's checked below on AMAZING TRIAL OFFER. If VIVIF does not catch more fish—bigger fish—and make fishing more fun—if VIVIF is not the greatest lure I've ever used you will refund my money immediately including postage.

Size	Weight	Color Comb	Model	Price
3X	16 oz.	Green-Silver-Bld	T-1	\$1.25
2X	16 oz.	Black and Gold	T-2	\$1.25
3X	16 oz.	Green-Gold-Bld	T-3	\$1.25
2X	16 oz.	Red and White	T-4	\$1.25
ALL 4 THIS SIZE FOR \$4.95				
3"	16 oz.	Green-Silver-Bld	T-5	\$1.45
2"	16 oz.	Black-Green-Bld	T-6	\$1.45
2"	16 oz.	Green-Gold-Bld	T-7	\$1.45
2"	16 oz.	Red and White	T-8	\$1.45
ALL 4 THIS SIZE FOR \$5.95				
3X	16 oz.	Blue and Silver	T-10	\$1.45
2X	16 oz.	Red and White	T-11	\$1.45
3X	16 oz.	Blue and Silver	T-12	\$1.45
ALL 3 THIS SIZE FOR \$6.95				

PAYMENT ENCLOSED Send VIVIF's Postpaid. I have all C.O.D. charges. (Money Back Guarantee on all VIVIF's.)

SEND C.O.D. I will pay postman price of VIVIF's plus C.O.D. postage. (Money Back Guarantee on all VIVIF's.)

NAME _____

ADDRESS _____

CITY _____ ZONE _____ STATE _____

SPECIAL OFFER ONE OF EACH SIZE VIVIF LURES ALL FOR ONLY \$1.00

CANADIAN CUSTOMERS Order from Harrison Tackle Company, 339 King St. W., Toronto, Ontario.

COMMAND PERFORMANCE— WITH **GRAVELY** **POWER!**



Unmatched Performance— Unmatched Versatility!

The moment you take command of a Gravely Tractor you'll discover the *performance* you've been looking for. No pushing, pulling or pampering this tractor . . . you just guide the Gravely while it makes your toughest jobs easy!

All-gear drive, power reverse, optional electric starter. *More power at the tool.* And the Gravely keeps working—year after year.

Power Cultivate

Ride and Mow
Rough or Lawn

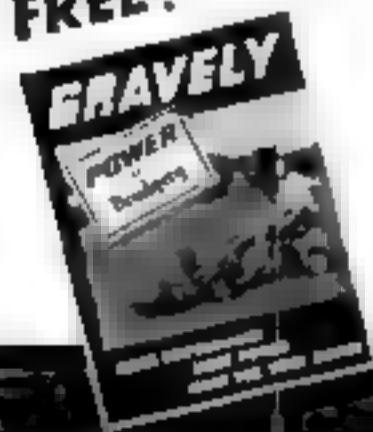


ONE Tractor—30 year-round Attachments

Plow a perfect seedbed in one operation with Rotary Plow—change quickly to Rotary Cultivator, power cultivate all season. Four bolts out, four bolts in and you mow the finest lawn or the toughest rough with the 30" Rotary Mower. RIDE with sulky.

Choose from four mowing tools, four garden tools, four snow removal tools, the right tools for the job . . . 30 in all.

FREE!



Big, 24 page Booklet, "Power Vs. Drudgery"

Illustrated with action pictures, some in color, FREE "Power Vs. Drudgery" shows how Gravely solves your lawn, garden, field and farm problems. Write Now!

GRAVELY TRACTORS

P. O. Box 602-B

Dunbar, W. Va.

Sold & Serviced by Authorized Gravely Dealers

You can light either end!

Taste PALL MALL...so

**GOOD!
GOOD!
GOOD!**



Good-looking, Good-tasting, Good-smoking Pall Mall!

Why does Pall Mall taste so good, good, good? Because Pall Mall's famous length of fine, good-tasting tobacco travels and gentles the smoke naturally—makes it mild—but does not filter out that satisfying flavor. That's why Pall Mall tastes so good! good! good! Never too strong. Never too weak. Always just right!



HERE'S WHY SMOKE "TRAVELED" THROUGH FINE TOBACCO TASTES BEST

- 1 You get Pall Mall's famous length of the finest tobaccos money can buy
- 2 Pall Mall's famous length travels and gentles the smoke naturally. Travels it
- 3 Over, under, around and through Pall Mall's fine, good-tasting tobaccos and makes it mild!

Outstanding...and they are Mild!

Enjoy satisfying flavor...so friendly to your taste!

© A.T.C. Product of The American Tobacco Company. "Tobacco" is our middle name.

In a Land Rover, Who Needs a Road?

By Alex Markovich

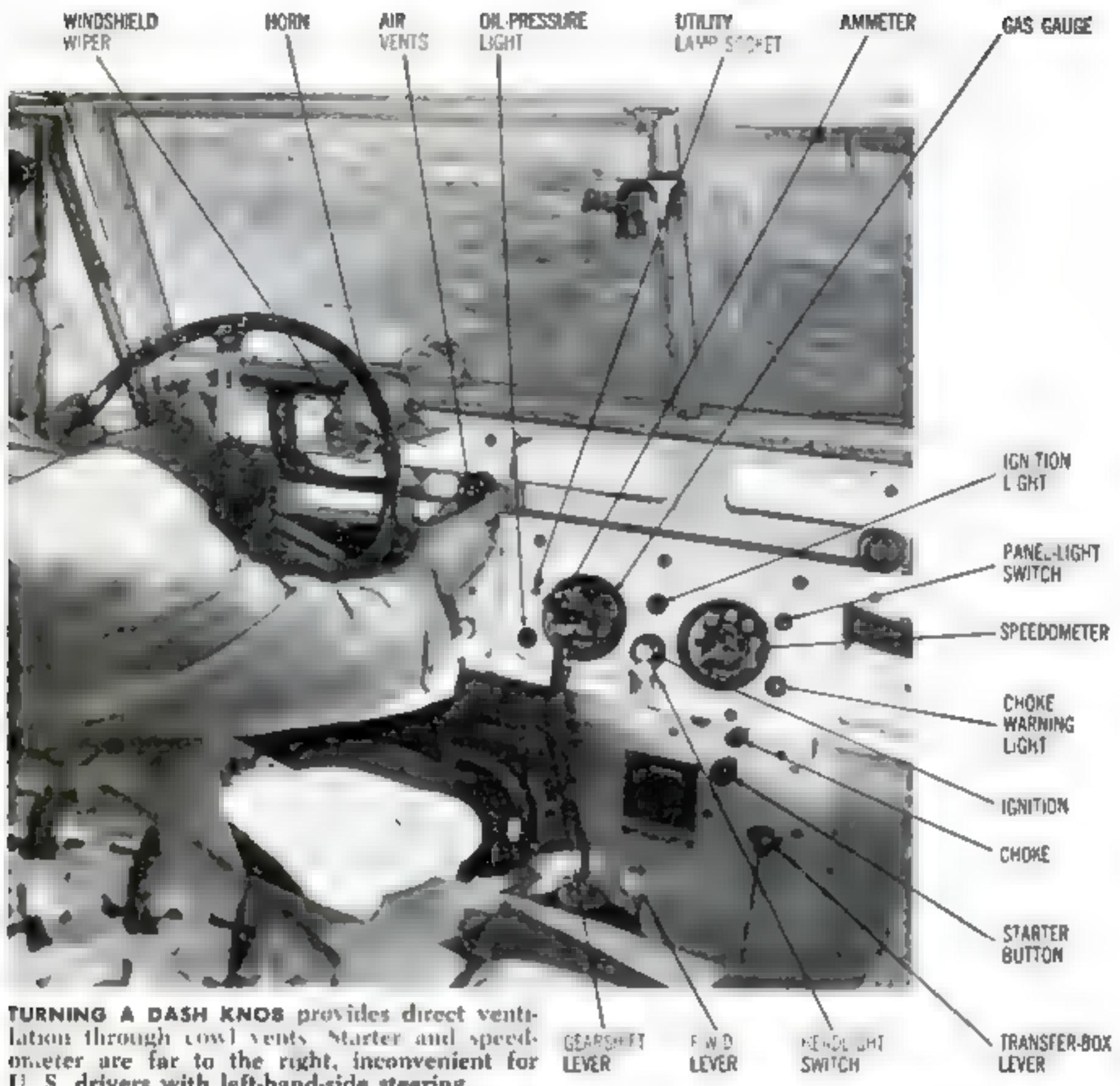
THE scratched and mud-spattered Land Rover inched its way up the 65-degree slope, the steel cable on its winch groaning. For miles in all directions stretched the almost impassable Darien jungle swamp of Panama and Colombia.



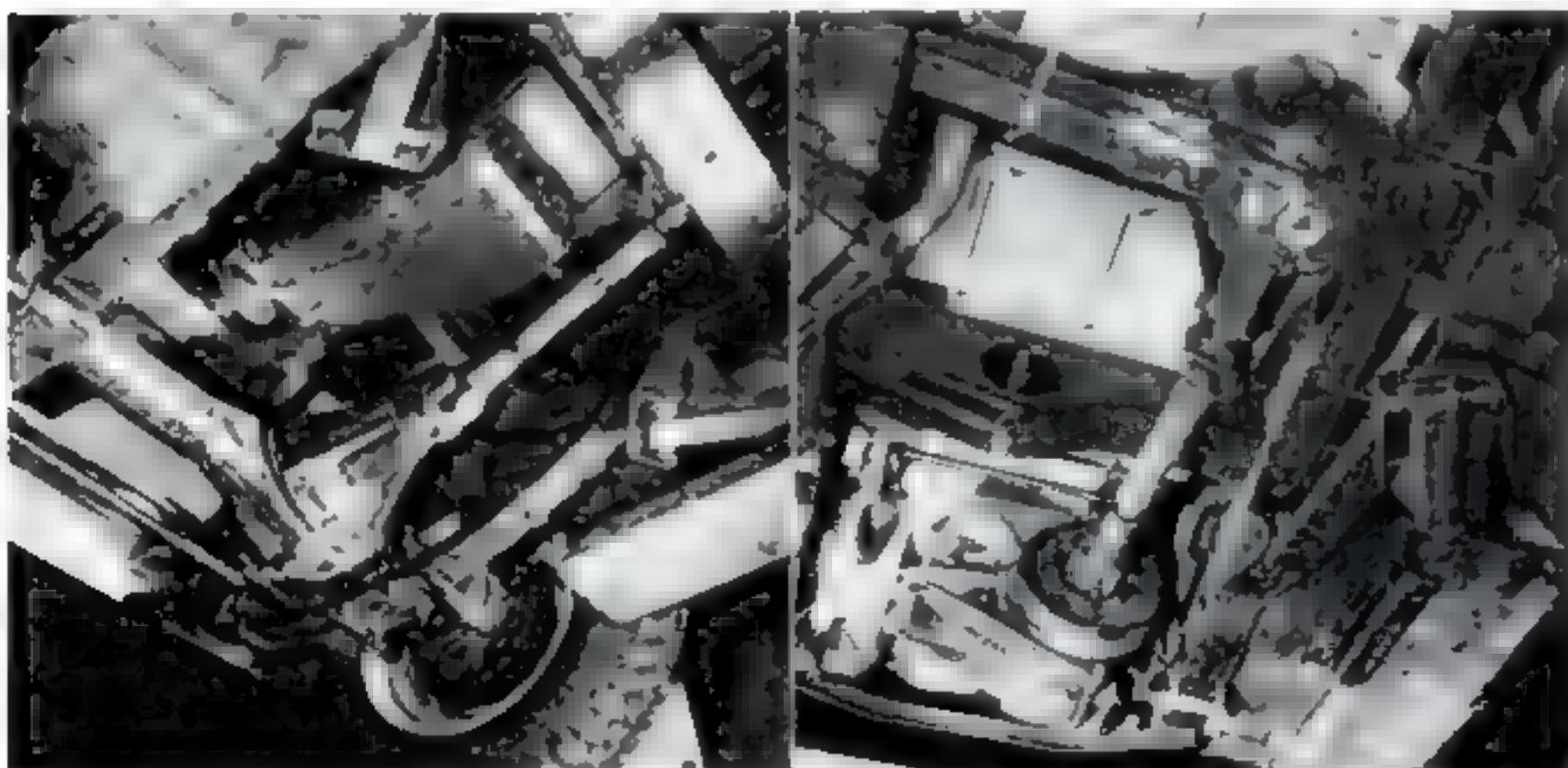
ROADS JAMMED with traffic? Just cut around through the woods. Plunk 'er into low-ratio four-wheel drive and the Land Rover climbs like a scared goat. The 40-degree slope below was child's play. Aluminum body is noncorrosive; enamel paint covering it is strictly for looks.



The Land Rover is the best friend this spunky, four-wheel-drive vehicle rivals the jeep



TURNING A DASH KNOB provides direct ventilation through cowl vents. Starter and speedometer are far to the right, inconvenient for U. S. drivers with left-hand-side steering.



MASSIVE SUSPENSION boasts semi-elliptic leaf springs and telescopic hydraulic shocks at front

(left photo) and rear. Road clearance under the differentials is eight inches.

Suddenly, near the crest of the hill, the car somersaulted backward and crashed upright against a tree 70 feet below. A pin had sheared in the winch. Thanks to seat belts and the sturdiness of the car's body, the driver was unhurt. The engine restarted on the first try, and within minutes the expedition was off again to complete the first crossing of Central America by car.

Nearly a third-way around the world in Holland, a freight-yard foreman was puzzled when a newly bought Land Rover burned out its heavy-duty clutch in a few weeks. The car had been bought for towing two or three unladen 10-ton railroad cars at a time. He investigated, and found that one eager-beaver driver had been towing four and five at a time. In fact, the driver boasted, he'd once hitched up and moved four empty cars and one fully loaded one—about 150 tons.

Nearly every Land Rover owner has some similar tale to tell. Land Rovers have been sat on by confused elephants and charged by enraged rhinos. They've plowed through quicksand, floorboard-deep water, Sahara sands, and arctic snow. Hardly an area remains in the world that hasn't been crossed by the plucky four-wheel-drive vehicles. Consequently, when I went to pick up our Land Rover my curiosity was tinged with awe. Would the car really live up to its reputation?

A Jeep with a British accent. I took delivery of the stubby little station wagon in Long Island City, N. Y. It was fully eight inches shorter than a VW, though much higher. All the aluminum and galvanized-steel body panels were squared off to cut tooling costs and eliminate needless overhang.

The interior was strictly practical; no niceties such as door upholstery, head liner, or floor mats. Leg room was scant, even for my five-foot-eight frame.

The four-cylinder, 77-hp. engine started instantly. I pushed the four-speed floor stick into first and rolled away. I soon found that second gear, like first, isn't synchronized and requires double-clutching. Additional ratios are provided by a transfer box; in effect, eight forward and two reverse speeds are available.

Riding the parkway leading upstate was a pleasant surprise. Though built for the roughest terrain, the Land Rover was



SPRUNG SEAT CUSHIONS LIFT OFF for access to roomy tool compartments. The vehicle is equipped with jack and full set of wrenches.



COMPACT ENGINE COMPARTMENT houses a 1.39.5-cu.-in. in-line four. A 125.2-cu.-in. diesel developing 31.2 hp. is available at extra cost.



ROOMY REAR COMPARTMENT seats four knee-to-knee. The spare wheel can be mounted on the hood to increase luggage space in the rear.



EVEN ELEPHANTS DRIVE 'EM. This car was specially built by the Rover Co. for an English circus. The animal steers with his trunk, but his front leg provides an occasional assist.

docile on the smooth pavement. Steering was quick and easy. The heavy chassis and light body resulted in a low center of gravity, so the vehicle cornered well. A major annoyance, however, was the noisy drive train—at 40 the whine made normal conversation almost impossible.

There's a touch of larceny in all of us. Approaching a parkway toll station, I had a fleeting thought of cutting off cross-country. I fought off the impulse.

Off-the-road test. Farther upstate I left the road to give the Land Rover a real workout. I pulled the transfer-box lever back into low, automatically putting the car into four-wheel drive, and charged up a 45-degree slope without benefit of a winch. I drove down the other side of the hill with the body leaning nearly 30 degrees.

At the foot of the hill was a shallow stream. I drove into it, followed the rocky bottom a few hundred feet, and



LITTLE DAMAGE is shown by the trans-Darien Land Rover after its backward somersault. The expedition took over seven months to complete a journey from Canada to Colombia.



ELSA, KENYA LIONESS made famous by a recent book, sits on her pet perch, a Rover's canvas roof. Raised from birth by Joy Adamson, she returned periodically when set free.

emerged on the other side. By this time the little car had given me a sense of exuberant power. I felt unstoppable. I barreled into a clump of trees, gaily weaving in and out among the saplings. After a few hours I grudgingly got back onto the parkway and headed home to get a woman's opinion.

My wife approached the car with unconcealed misgiving. She thought that it looked like a shrunken Brink's truck. One problem immediately became evident: The lack of a doorstep on the smaller-wheelbase model makes entry difficult for women in skirts. I had to give my wife's bottom a boost to get her in with some semblance of modesty. She probably didn't like the stiff suspension either, but the drive-train noise drowned out absolutely all complaint.

Women just don't seem to understand what a terribly practical vehicle the Land Rover is.



Midget fireboat gets into close quarters for battling blazes under pier structures like this.

Baby fireboat propelled by its own pump

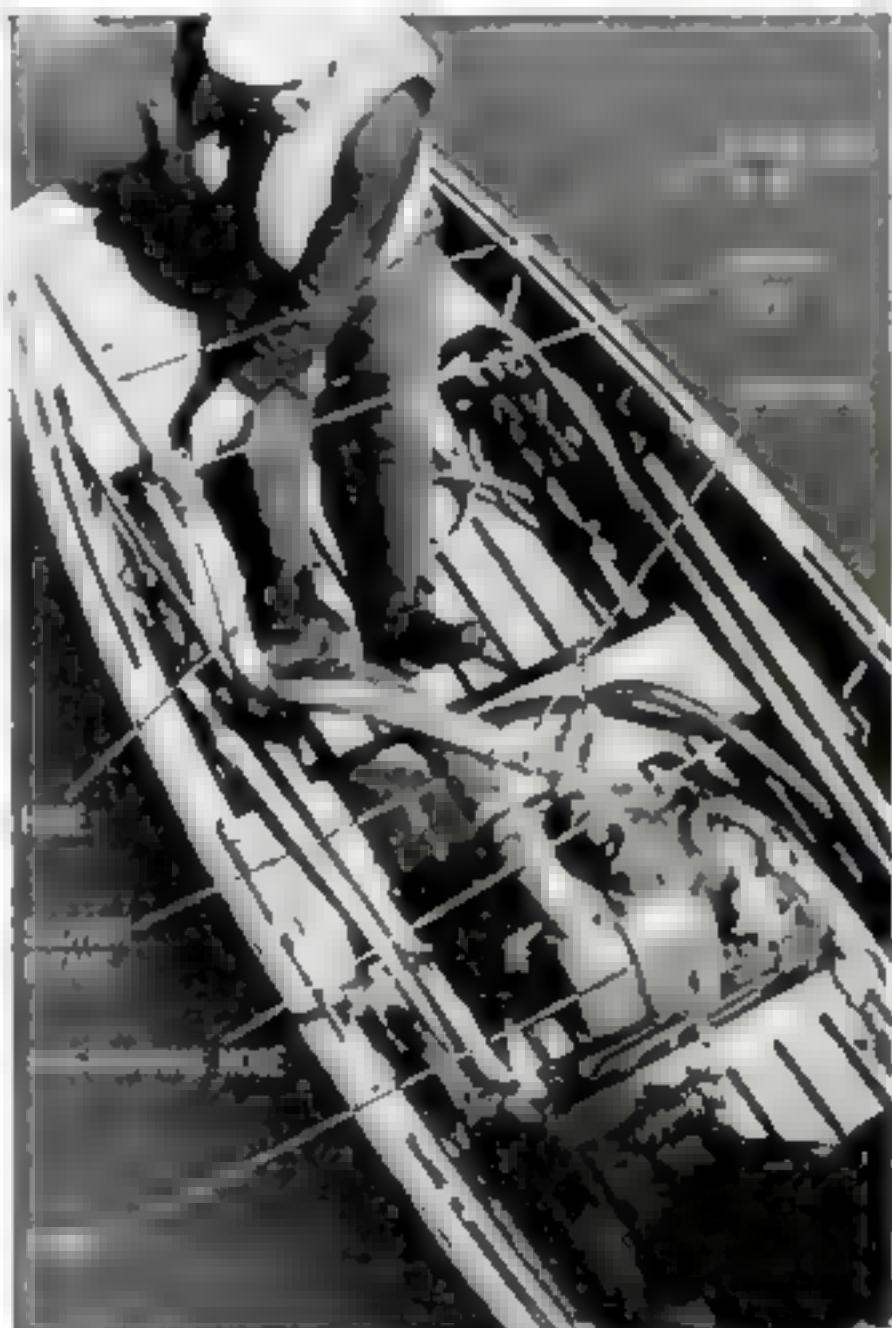
"Fireboat No. 1½," a two-man skiff ingeniously propelled by water jet, fights San Francisco pier fires from underneath.

It used to be rowed to blazes of this sort, but the oars were often a plaguey nuisance in close quarters. So one of the firemen devised a way to let the boat's 300-gallon-per-minute pump provide propulsion as well as douse flames.

He divided the discharge. Part of it can be shot out of a $\frac{1}{8}$ -inch nozzle at the base of the tiller, thus pushing and steering at the same time. When the pump's full capacity is devoted to this purpose, No. 1½ can make seven or eight knots. Once at the fire, all the flow can be diverted to fighting it, or some of the water used to maneuver the boat.



JET NOZZLE at stern can be swung by tiller to port or starboard to control boat's direction.



JET PROPULSION comes from pump that also provides water for fighting harbor fires.

Compact airplane

A small two-passenger sports and training plane is being put out by Piper Aircraft. Its 108-hp. Lycoming O-235 engine provides a 120-m.p.h. top speed and, with standard 18-gallon fuel tank, 345-mile range. An extra 18-gallon tank is optional. The Colt's base price is \$4,995, a third less than most two-seaters.

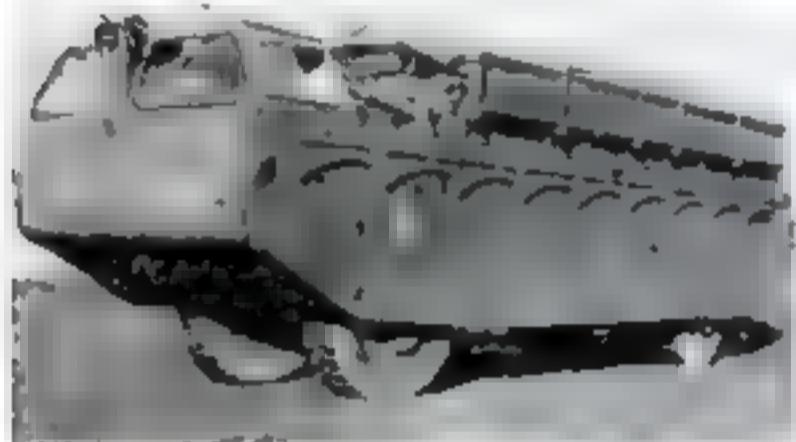


Army Bridge Travels Cross-Country



COMBAT-LOADED M-48 TANKS cross a Gillois bridge during maneuvers in Germany. The river

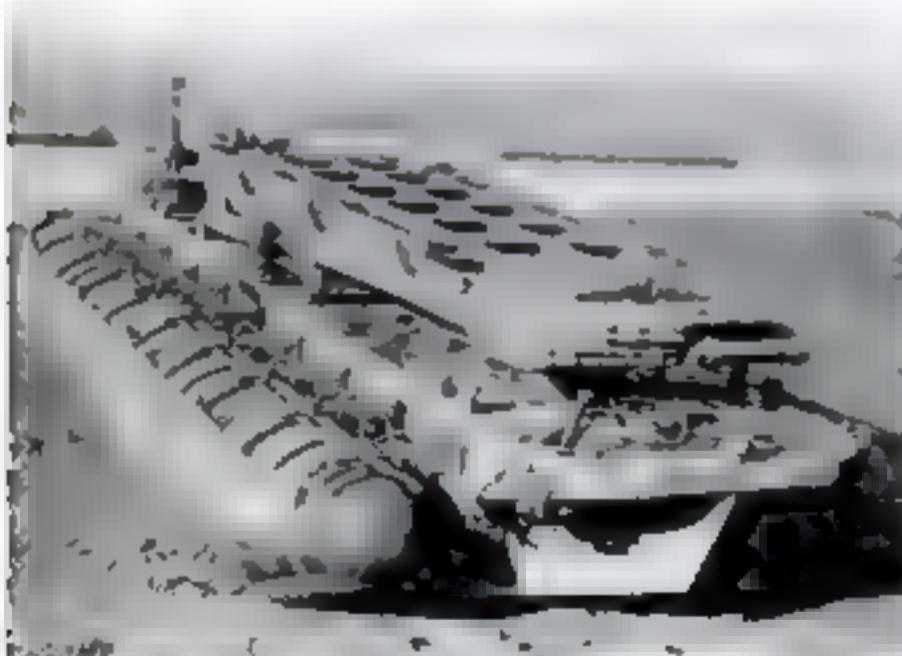
span consists of a 26-foot ramp at each end and bridge sections of the same size in between.



BRIDGE UNIT is shown here on the road. Four bulkheads divide the 36-foot steel-plate hull into a crew compartment, an engine room, two air-filled wells to receive the retractable wheels, and the bow. No economy-run winner, the bridge-toting vehicle gets 2.7 miles per gallon.



AIR COMPRESSOR fills the lowered pneumatic floats with 5.30 cubic feet of air in less than six minutes. The 222-hp. Kaelble six-cylinder diesel that powers all four wheels also drives the rudder-propeller unit, shown being lowered. Driver's cabin becomes the stern. A pilot stand on the roof is raised manually when the vehicle takes a dip. Water speed: eight m.p.h.



RAMP IS MOUNTED on same kind of vehicle, but is detachable. Once the ramp is anchored offshore and attached to bridge sections, its carrier vents its wheels to lose six inches of freeboard; carrier then is driven from under ramp and can be used for other operations.



BRIDGE SECTION is rotated and widened to 13 feet hydraulically. Unit then travels under its own power and attaches to the rest of the bridge. A powered raft for troop transport can also be formed by joining several bridge sections and two of the ramp units.

at 55 m.p.h.

A convoy of bulky, angular, khaki-colored vehicles bumps along open fields and rumbles up to a river bank.

Deflated pneumatic floats flap down along the sides, then swell bulbously. The vehicles drop clumsily into the water, and the wheels retract, turtle-like, into the hulls. Folded ramps atop the decks extend and swivel 90 degrees, and are secured in a long row by hydraulic lock pins.

Within a few hours a floating bridge spans the river.

This fantastic river-crossing equipment may sound like the fanciful rambling of a daydreamer—but it actually exists today. And it works. Designed by a French military engineer, Colonel Gillois, it is being built for the French Army by a West German manufacturer.

The U. S. Army is also interested. Extensive testing in Germany by the 552nd Engineer Company has shown that the new mobile bridge can be assembled at over 400 feet per hour by 185 men. The currently used pontoon bridge takes far longer to set up, and requires a work force of 1,000 men, as well as scores of trucks to ferry the rubber pontoons and roadbed, and cranes to lower the pontoons into the water.

Another important advantage of the Gillois bridge is that it can be used over and over. After an attack column has crossed the river, the bridge can be dismantled quickly and scooted overland at up to 55 m.p.h. to meet the next water obstacle.—Harry W. Stephens.



ANCHORED RAMP UNIT (above, left) is connected to a bridge unit. Span is formed two halves at a time. The halves are then beached, ramp-first, and joined. Downward hydraulic pressure on the ramps steadies the bridge with help of propellers working against the current.



Test for rocket A-engine

Twin plumes shoot skyward in the photo above as Kiwi-A3, a forerunner of an atomic engine for a rocket, goes into action at the Atomic Energy Commission's Nevada test site. In the foreground, the nozzle of the barrel-shaped, uranium-fueled reactor, mounted upside down for tryout, spews aloft an A-heated jet of flaming hydrogen gas.

White column in background, from a smoke pot, helps sampling aircraft to follow the exhaust cloud and keep tabs on the spread of radioactivity it contains. Successful trial, third of a "Kiwi"-type or nonflying reactor, marks progress in developing materials able to withstand engine heat of thousands of degrees for an A-powered rocket expected to fly by 1965.



Limousine conversion

A detachable partition converts the British Rover three-liter sedan into a status-symbolizing limousine for business use. The wood frame with sliding glass panels attaches to the door pillars by spring-loaded plungers. Fillers on each side of the front seat complete the separation.



O'Sullivan's Wonderful Lead Balloon

His idea looked ridiculous; it failed seven times. And then it launched Echo I, the biggest and brightest satellite of them all

DESIGNER of successful Echo satellite, William J. O'Sullivan Jr., has followed novel precept: If a moon fails to orbit, build a bigger one.

OUTSHINING most stars, Echo I passes overhead in orbit. Pace is indicated by length of its bright trail in photo's 40-second exposure. Easily seen with unaided eye, Echo has given many their first thrilling look at a satellite sailing across sky. Its great 1,000-mile height kept it sunlit and visible all night at the season of its launching last August. Later, earth's shadow hid it much of night; now it's emerging from this "eclipse," which will end in the spring.

By Don Murray

ECHO I, the huge space balloon that, since last August, has been whizzing around the earth at 15,000 miles an hour, has proved a number of things. By bouncing radio signals back to earth it has demonstrated the feasibility of a new global telephone and television communications system using micro waves. By measuring for the first time the minute air density 1,000 miles above the earth, it has proved that our atmosphere still exists at that altitude. But more than anything else, by its very existence the space balloon has proved that old-fashioned stubborn perseverance is still a

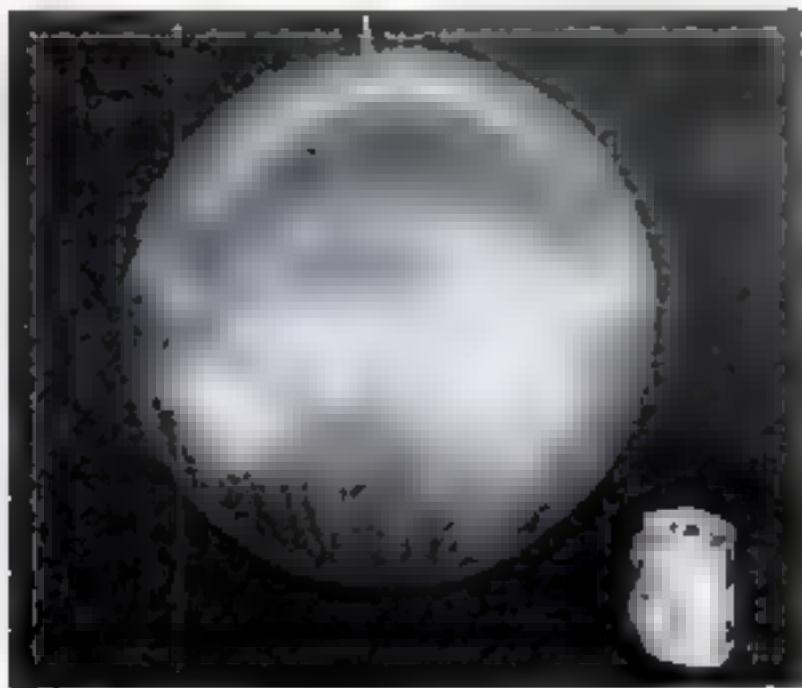


most important element in a technological society.

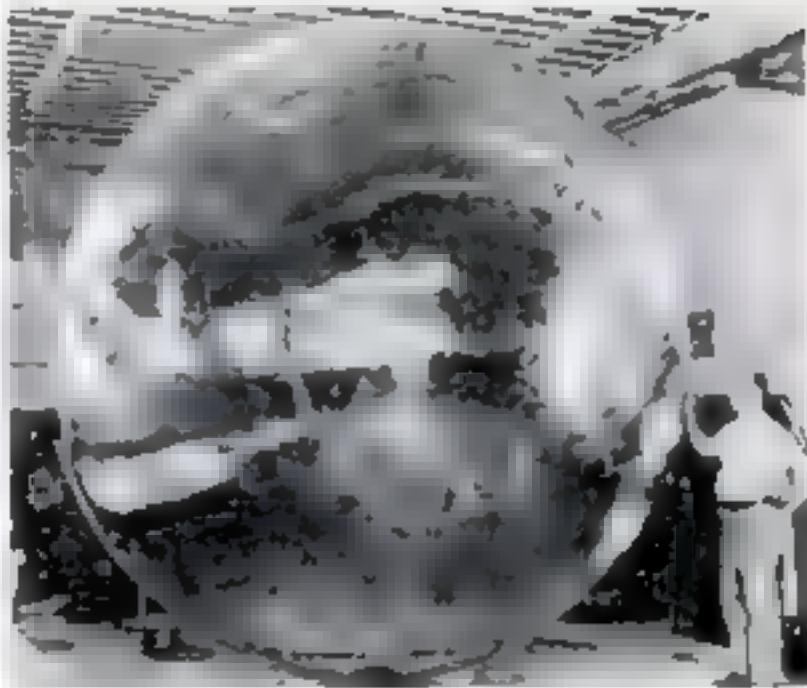
An employee of the National Aeronautics and Space Administration, 45-year-old, sandy-haired, chain-smoking William J. O'Sullivan Jr. didn't build Echo I by himself but for years it seemed as if he alone believed in it. This, however, in no way deterred him. He made the creation of inflatable structures in space a personal crusade. While others said the idea of space balloons was ridiculous, O'Sullivan heckled, harried, and hornswoggled both those who worked for him and those he worked for.

He went through channels, around channels, under channels, and even be-

Forerunners show how the Echo satellite grew



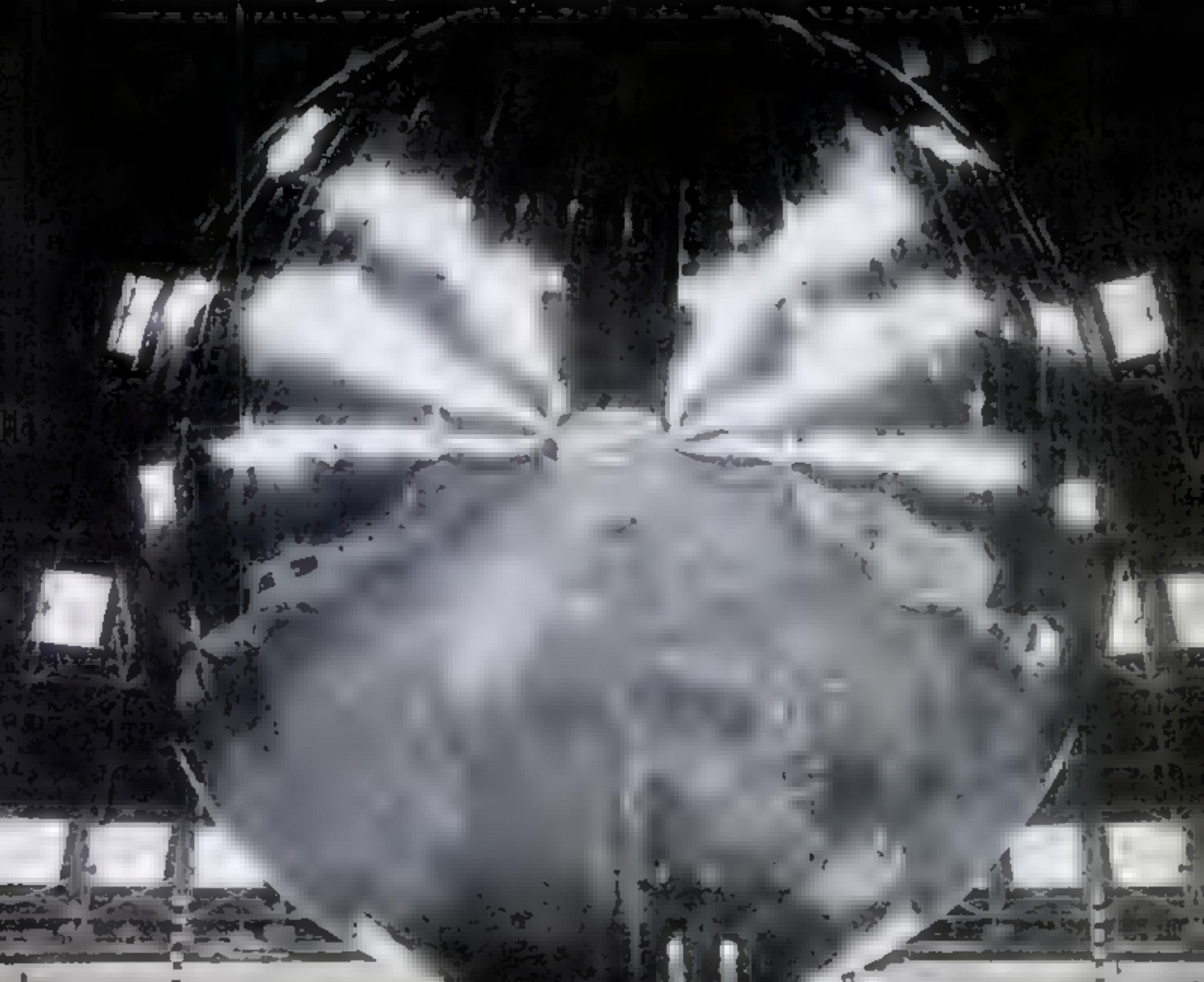
FIRST BALLOON SATELLITE, shown inflated and packaged, was 20-inch one. Similar 30-incher rode Vanguard rocket, got nowhere.



TWELVE-FOOTER came next. Two launching tries, with Jupiter C rocket and Juno II, both failed. Hundred-foot Echo followed.

TEN-STORY-HIGH, 100-foot Echo gets air-inflation test before launching. Shiny aluminum coating

for its plastic skin gives satellite high visibility and reflects radio waves back to earth.



Born as a research tool, balloon satellite becomes promising

yond channels to the White House itself, shepherding his crazy idea through years of discouragement as experiment after experiment failed—until that triumphant August day when millions upon millions of people looking heavenward in Europe, Asia, and North America saw Echo I curve gracefully from horizon to horizon.

New world in the sky. O'Sullivan has been looking heavenward since he was a boy in Kentucky. When he took his first plane ride in an open-cockpit plane at 18, he saw a vision of a new world in the sky to be conquered. At the worst of the depression he turned down a scholarship in archeology at the University of Kentucky "because I don't want to dig a hole in the ground, I want to dig a hole in the sky," and went to Notre Dame, where he earned all his expenses waiting on tables and repairing radios.

During his last semester, the University administration was shocked to discover that O'Sullivan had taken and passed so many courses that he was entitled to degrees in physics, another in aeronautical engineering, still others in mechanical, chemical, and civil engineering. Somewhere he had broken some rules and beaten the system, but you can't punish a boy for being smart. Nevertheless, O'Sullivan's dean called him in and told him he would have to spend several more years in residence to receive all the degrees; otherwise he could have only one. O'Sullivan chose aeronautical engineering.

After graduation, in the depression year of 1937, he considered himself fortunate but was amused when he got a job as an insurance actuary and put in some two years figuring fire-insurance rates for the entire state of Kentucky. Then he took Civil Service examinations in aeronautical and mechanical engineering, and landed a job at the national aeronautics research center at Langley Field, Va. He has been hurling himself at the advanced problems of planes, missiles, and space ever since.

The problem of upper air. It was five years ago, while he was working with a committee of scientists in Ann Arbor, Mich., to choose the experiments to be attempted in space during the International Geophysical Year, that O'Sullivan

got his idea for a space balloon. All day long on Jan. 26, 1956, the committee considered ways of measuring the density of upper air. This was vital work. Accurate measurement of the thickness of the upper atmosphere would affect the course and design of every missile and satellite.

That night O'Sullivan couldn't let the problem rest. It seemed to him that none of the proposals seemed to attack the problem effectively. Technically, he was supposed just to judge the suggestions, not to make any of his own, but his brain itched to attack the problem. He yanked out a pad of white lined paper, gripped a pencil, and began a personal assault. He reasoned that if you heaved a large, light object into the air, which would be pushed around even by an infinitesimal amount of air, that then you could measure the push and figure out exactly how much air was in that part of the sky. But how on earth could you get a large object into space when our rockets had not yet orbited a grapefruit-size satellite?

His answers didn't come in a flash. They were the results of hours of muscular thought. O'Sullivan concentrated, sweating out all the combinations of facts that might provide the answer. He worked far harder than if he had been digging a ditch. He forced his experience, his knowledge, and his imagination to their limits.

After half the night he came up with a solution. Why not build a large satellite of thin material that could be folded in a nose cone and shot far above the earth



COLD STONE CALL

BOUNCED OFF ECHO, radioed voices, music, pictures span U.S. or ocean. "Passive" system takes high power, well-aimed antennas—but no electronic gear beyond servicing reach in space.

new aid to communication

to be expanded there, where the atmosphere is thin and would exert little pressure on it? It need not be of rigid metal, furthermore, since at the edge of space it would be able to support itself.

Like most really good ideas, this one was simple and obvious. It just hadn't been thought of before. O'Sullivan's hands raced over the paper. Build it of a metal foil, he thought, or a plastic covered with a metal, perhaps lead, which wouldn't be affected by solar radiation.

The lead balloon. O'Sullivan flung himself into bed exhausted, but filled with the satisfaction of a job well done. He couldn't sleep, however. He worried about what his fellow scientists would think of his proposal. He spoke aloud, "It will probably go over like a lead balloon!" and sat up in bed. That was just what he was proposing, wasn't it? Why not lead?

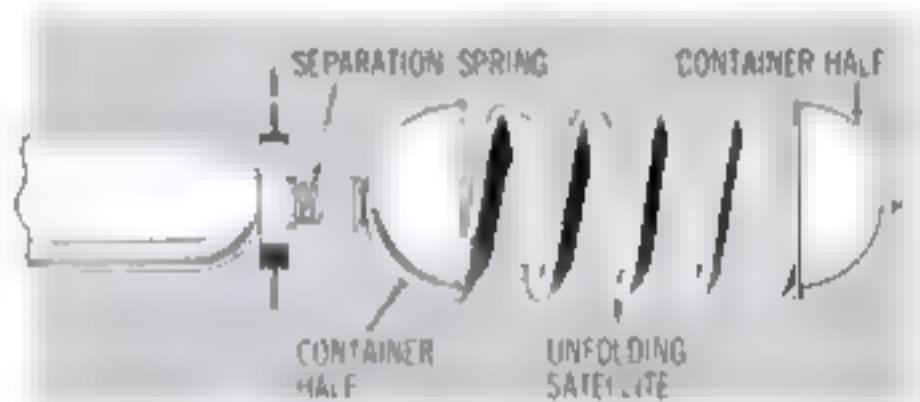
The next day some of the experts who studied his suggestion were dubious about putting a big bubble in the sky, but others saw its possibilities. There was another problem, however. Experiments with more priority had taken up the relatively tiny area at the top of a Vanguard. There was only a little doughnut of room left over. Could he pack his balloon in there? And could he make it weigh no more than seven-tenths of a pound? He puffed at a cigarette, then nervously rubbed it out. He'd try that, too.

O'Sullivan was off on another crusade. Back at Langley he politicked his superiors into supporting his work, picked a team, and got to work. They tested a hundred plastic and metal foils. The satellite skin would have to be thin, flexible enough to be folded, and yet so tough that it would not tear apart when it was exploded into a sphere. It would have to be rigid when it was inflated. And there was the problem of temperature. The satellite would be outside the protection of the lower atmosphere, and the temperature of sunlight on its surface would be at least 300 degrees Fahrenheit. Minutes later it would whirl into the shadow of the earth, where it would suddenly be cold—at least 80 degrees below zero. What plastic could stand that?

They found the answer—Du Pont Mylar, a plastic used for recording tape, and



IN THE MAKING, 100-foot satellite is assembled by fitting and cementing gores of plastic. Folded and packed into a metal sphere, it is then boosted by rocket into orbit.



IN SPACE, halves of spring-pudged sphere come apart and balloon unfolds. Self-inflating, it contains a powdered chemical, anthraquinone, that turns directly from a solid into a gas.

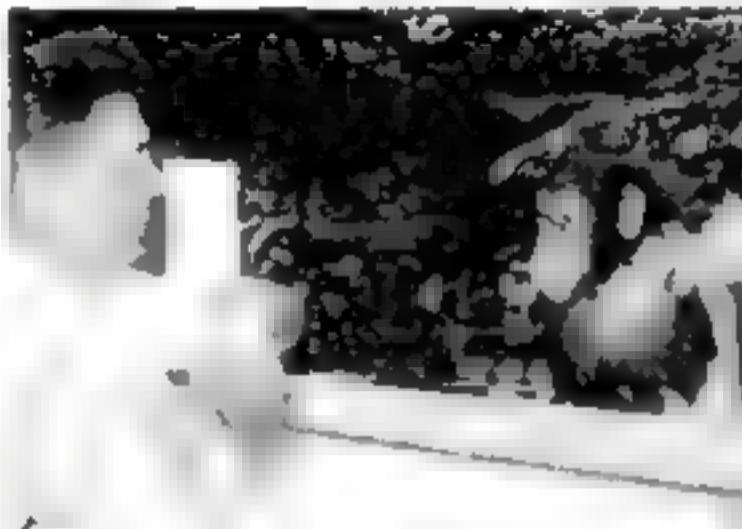
for those bags filled with frozen food that you can take out of the freezer and put directly into hot water. It had a tensile strength of 15,000 pounds per square inch, one-third that of mild steel, even when it was manufactured in sheets only .0005 inch thick, half as thick as a cellophane wrapper on a pack of cigarettes.

All right, that's solved, now how about the covering? Some metal would have to protect the satellite against radiation, help it keep its shape, and also make it visible to radar scanners. Metal after metal was tested and ways tried to paint

[Continued on page 220]



OPEN WIDE. Big Boy, good-natured 11-year-old gorilla at left, takes vitamins from spoon extended through bars by zoo's Dr. Byron Bernard.



GO AWAY, BAD MAN. Young chimp remembers shots Dr. Bernard gave with needle. He's friendly with keepers, but he doesn't like the doctor.

Zoo Doctor Treats Dangerous Patients

A veterinarian caring for animals in a zoo has an often exciting and hazardous occupation. Once, a 4½-ton elephant suffered a fatal heart attack and narrowly missed falling on Dr. Byron Bernard, who was treating him at the Cincinnati Zoological Gardens. On another occasion he was grabbed through the bars of a cage by an enraged chimpanzee and could have lost an arm or his life if four keepers hadn't been nearby to beat off the animal. Chimpanzees, the doctor believes,

are the most dangerous creatures he's called upon to treat. They remember and resent the sting of medical shots, and become difficult to handle with age.

Most of the zoo doctor's work is preventive medicine, feeding his charges balanced diets, keeping them in condition, and watching newly shipped animals during a quarantine period. Dr. Bernard has also splinted the leg of an ostrich, which has a thighbone as big as a horse's; trimmed the teeth of a hippopotamus;



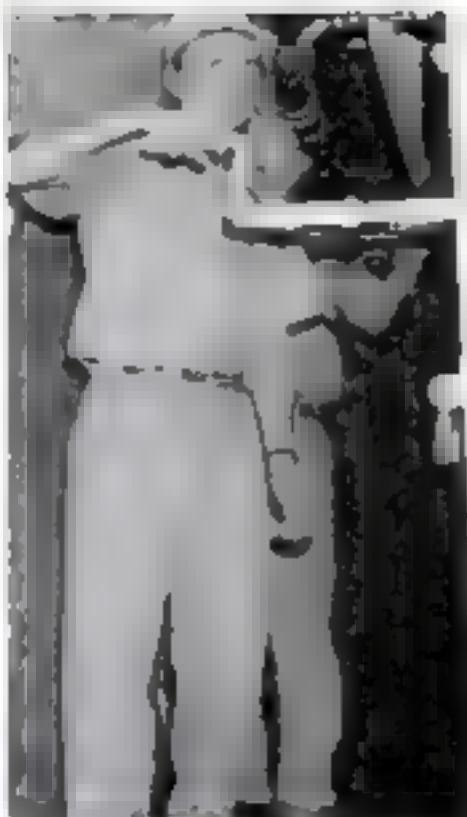
EASILY HANDLED by zoo's expert reptile men, this python is hard to keep healthy. Parasites prey on snakes; proper environment is a problem.



TIME TO PLAY. Dr. Bernard's young daughter, in nurse's uniform, fondles two six-week-old lion cubs. They'll soon be too big for this kind of play.



OIL FOR THE RHINO is applied from an oilcan by a zoo attendant. The horn has to be oiled once a week to keep it sleek and healthy.



SQUEEZE-CAGE, cranked to narrow slot with screw (above), crowds this hyena so he can't bite or claw when the veterinarian administers his medication.

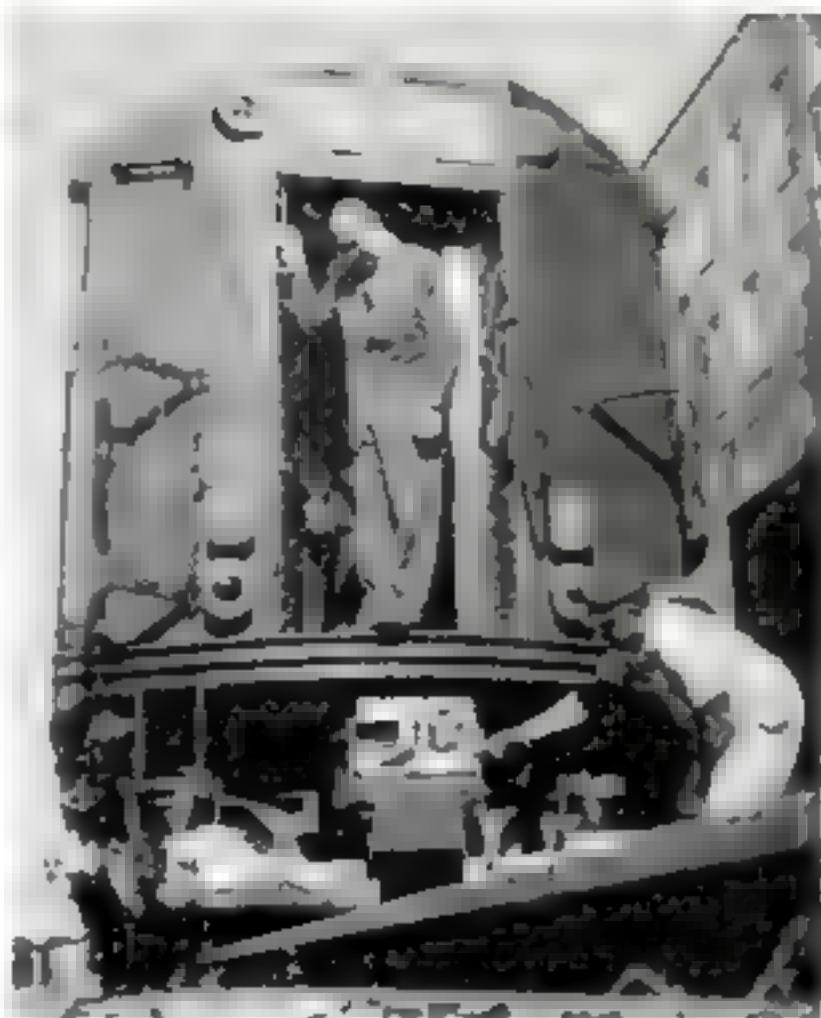
OH, SO SICK, and Sheeba, the tiger, looks it. Ordinarily easy to get along with, she has to be put into a squeeze cage for treatment.

operated successfully on a black leopard to remove a cancer; and pulled the aching tooth of a tiger, a two-hour task.

He never knows what his next job will be. He is in charge of 2,200 patients, and anything can happen to one or more of them at any time—and it usually does.



CHEETAH HELD BY THE TAIL could claw Dr. Bernard seriously, but this one was so sick that he couldn't stand up, let alone strike out.



Remote-controlled subway

The world's first fully automated train, a three-car subway, soon will be shuttling passengers between Times Square and Grand Central Station in New York. Automatic wayside dispatchers transmit electronic impulses via the rails to a receiver coil mounted on the train's undercarriage. Six code-carrying circuits in the rails control starting, speed, brakes, doors, lights, and destination signs.

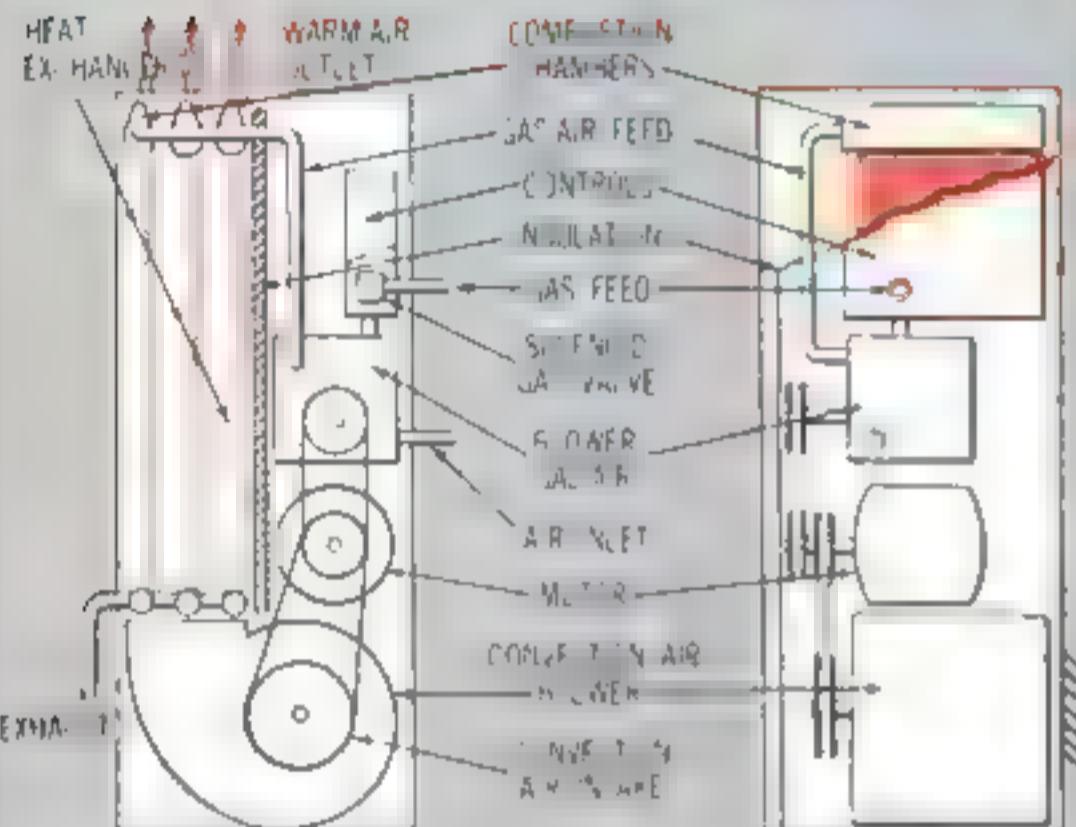


Flexible gasoline can

You can carry this emergency gasoline container in the trunk without rattle. It holds four gallons and is made of nylon fabric impregnated with oil-resistant synthetic rubber.

The British-made bag collapses as the gas is poured, thus eliminating air lock. It weighs $1\frac{1}{2}$ pounds when empty and can be rolled into a tight bundle for storing away easily.

New Gas Furnaces Glow, Pulse, Even Burn Without Flame



WARM-AIR FURNACE designed by American Thermocatalytic Corp. is a chimneyless, compact unit with 100,000 BTU-per-hour output. Heat is supplied by three radiant cores (at top).

By Joan Steen

QUESTION: What do these four things have in common?

- A slim object, very like a fluorescent tube, that glows with a slightly mildewed yellow color.
- A pulsing mechanism that's a tamed version of a World War II buzz bomb.
- A cannibal-styled rig that feeds back some of its heat to power a fan.
- A hunk of ceramic hung outdoors that could make swimming pools year-round diversions.

Answer: They're all furnaces.

What's more, they're all gas-fired, all new, all promising to deliver the last drop of heat from Scrooge-like portions of fuel.

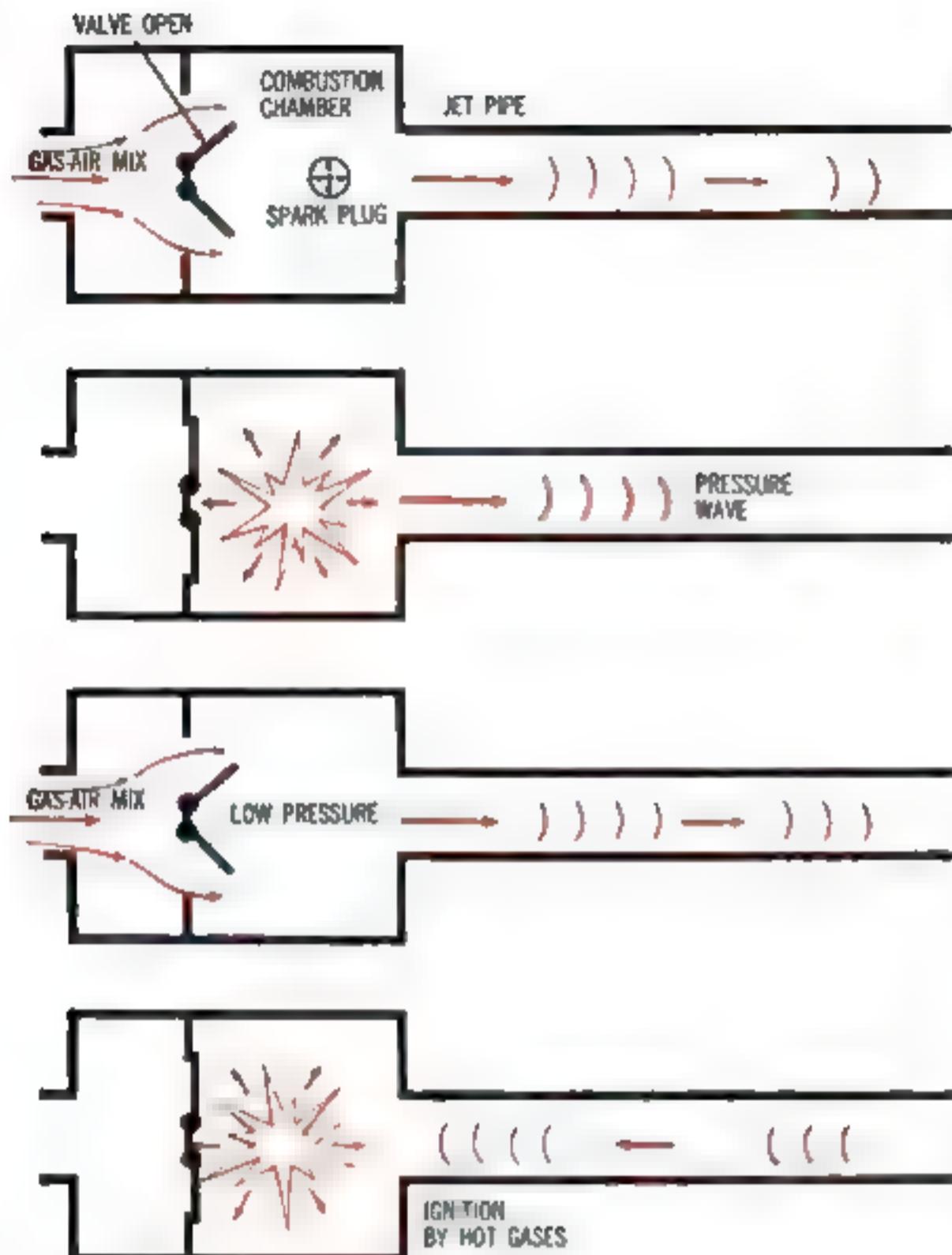
Gas-appliance manufacturers, out to top competitors pushing electrical and



HEAT EXCHANGERS get streamlined. Slim strips of finned stainless steel will be used in the warm-air furnace at left. Lightweight and flexible, the flat tubing costs less and will deliver more heat than conventional heat exchangers. Here a lab technician holds a sample with built-in hollow chamber to house a small Pyrocore reactor.

oil systems, have had to come up with heat in tidier packages. They've streamlined conventional systems into smaller, chimneyless, sealed combustion units. New ones, some still only prototypes, will include these features, as well as completely revamped burners. While they may cost more, their promise of close to 100-percent efficiency compared to 60 or 70 percent for conventional systems will save you money in the long run.

Flameless heat. The most radical of the new burners is the one with the fluorescent-tube look—the "Pyrocore" reactor developed by American Thermocatalytic Corp., Mineola, N. Y. The reactor radiates heat like a small sun, glowing at almost 2,000 degrees F. seconds after it's turned on. But the reactor is no ordinary burner. It uses catalysts—substances accelerating a chemical change



BUZZ-BOMB INSPIRED. this is the new Lucas-Rotax boiler. The first mix of fuel is spark-ignited. Expanded hot gas moves out into the

jet tube leaving a low-pressure area behind it. As a second mix of fuel is forced in, some of the outgoing gas returns to ignite it.

while they themselves stay out of it—to maintain combustion once it has been started.

These special catalysts are imbedded in the porous reactor tube. When a gas-air mix under slight pressure is fed into the tube, it is at first ignited electrically. As the mix heats and expands, it squeezes through the tube pores, making the surface incandescent (at about 2,000 degrees F.) and radiating heat outward. But some of the heat feeds back to the catalysts. These in turn stir up the gas and air so that they combine with the intensity necessary to maintain the ultra-high surface temperature.

The Pyrocore can be used directly in open air or, properly encased, as a space heater. It can be sheathed in metal and hooked up to a secondary heat exchanger for a hot-air or hot-water system.

Vented applications need no chimney. The exhaust may be pumped directly outside. Since Thermocatalytic combustion is near perfect the exhaust is exceptionally clean—no soot.

So far the company has been a supplier to industry rather than to the general public. It makes basic Pyrocore reactors in modular units along with a growing list of components: power packs, blowers, heat exchangers, etc., to be assembled as desired.

But the hint is that soon they will have available a warm-air central system for house heating. While they are not ready to take orders yet, they promise that the heater will take up less than half the space of comparable systems, furnish 100,000 BTU at very high efficiency, and use a novel heat exchanger—a flexible finned strip of stainless steel.



A SNOW-FREE ISLAND in the sun—or the simulated sun produced by a set of Schwank Infrared heaters overhead. Incandescent ceramic walls lining each unit emit infrared rays.

compact and lightweight. Best news is the system's cost—it will match conventional systems in the medium-price range.

Pulse heat. One central-heating, hot-water system already on the market is Pulsamatic—the heater patterned after a buzz bomb. Developed in Canada by Lucas-Rotax, of Toronto, the small unit (only four cubic feet) is another radical departure from conventional ways of burning fuel. A small-diameter plastic hose takes in outside air and feeds it with a measured amount of gas into a sealed combustion chamber. The first charge is ignited electrically, and expanding hot gas moves out in a pressure wave into a jet tube. A second helping of fuel now is forced into the low-pressure chamber and some of the outgoing hot gases rush back to ignite it. In this way heat pumps its way through the jet tube in short fast pulses—70 cycles a second. A muffler quiets the pressure-wave noise.

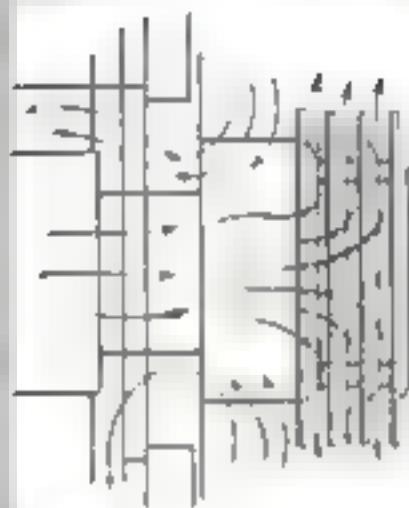
There is no open flame, no need for chimney or wide draft vents, and since no inside air is used, there are no chilly



THERMIONIC GENERATOR offers one way to convert heat directly to electricity. Electrons are "boiled" off metal plate and then collected on acceptor plate a hair's-breadth away. The gas-fired converter shown in cutaway model was developed by Thermo-Electron Engineering Corp., Cambridge, Mass. Need for space-vehicle converters is spurring research.

REALLY PORTABLE, radiant heater run on bottled gas is shown set up for driveway use. The screened-in box at the top houses one of American Thermo-catalytic Corp.'s Pyrocore reactors. The hollow tube—a refractory material imbedded with catalysts—heats to surface temperature of 2,000 degrees F. or better. But there's no flame. It can't be blown out in a high wind.



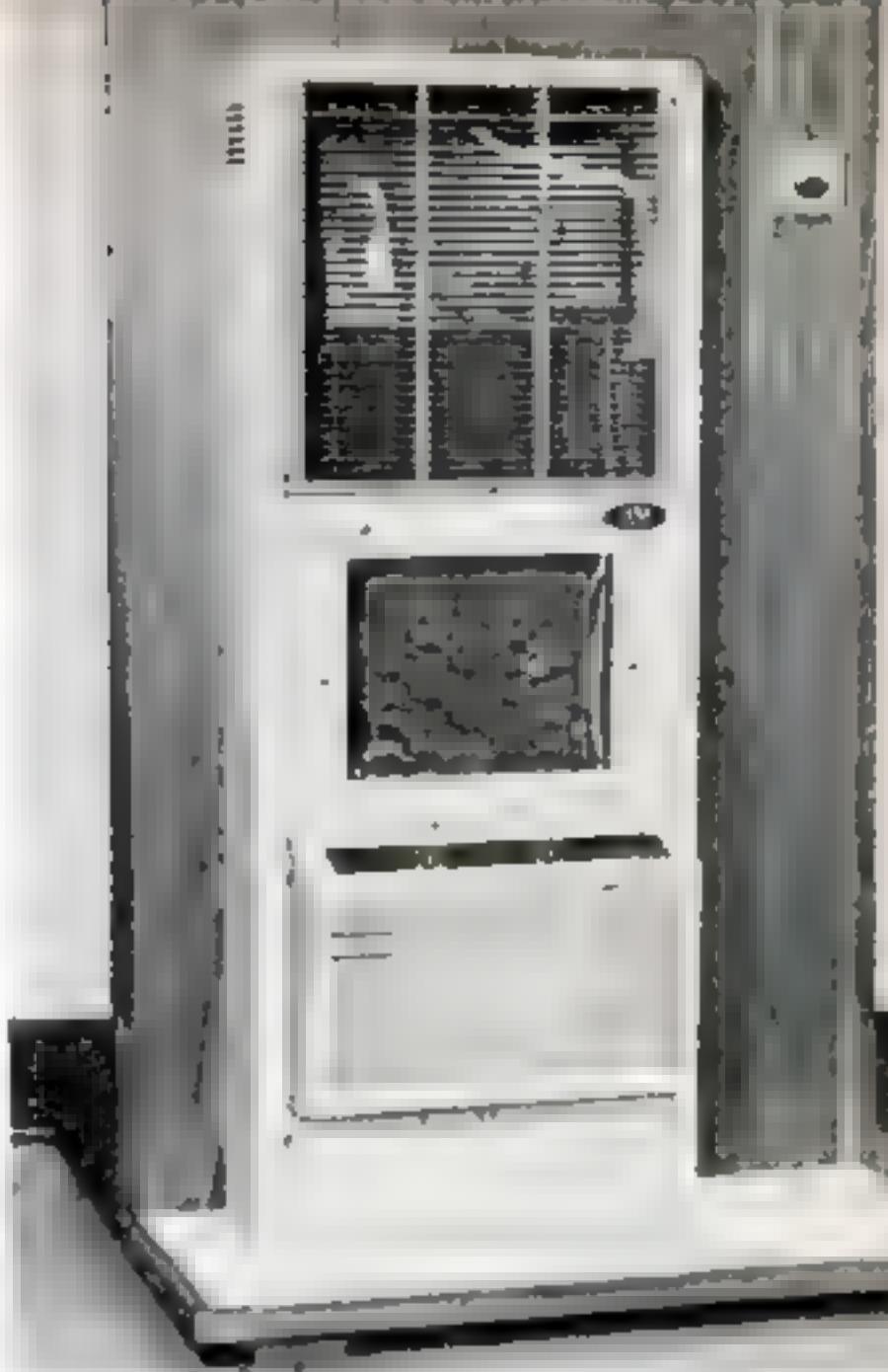


CHIMNEYLESS HEATERS made by Empire Stove feed intake and exhaust vents directly outside. Incoming fresh air circulates around exhaust and cools it. Model shown is two feet high, 16 inches wide. It can be recessed in place.

inside drafts. Again the exhaust is clean and the efficiency high—on two counts. One is the greater heat transfer possible with a pulsing flow of gas. The other is the unusually low exhaust temperature—lower than the dew point. Water vapor is condensed to avoid heat loss. The result is an efficiency rated at 90 percent. Output is 100,000 BTU an hour.

Thermoelectricity. Two "cannibal" furnaces—they feed back a little of their heat to run fans and blowers—are in the prototype stage. One is a wall heater designed by Minnesota Mining and Manufacturing, the people who make Scotch Tape. The trick here was to build in a bank of thermocouples above the furnace chamber. It takes very little heat to set the dissimilar metals of each thermocouple to making electricity. A bank of them can generate enough current to power a warm-air circulating fan as well as operate the temperature controls.

The second thermoelectric system is smaller—a bathroom heater developed by



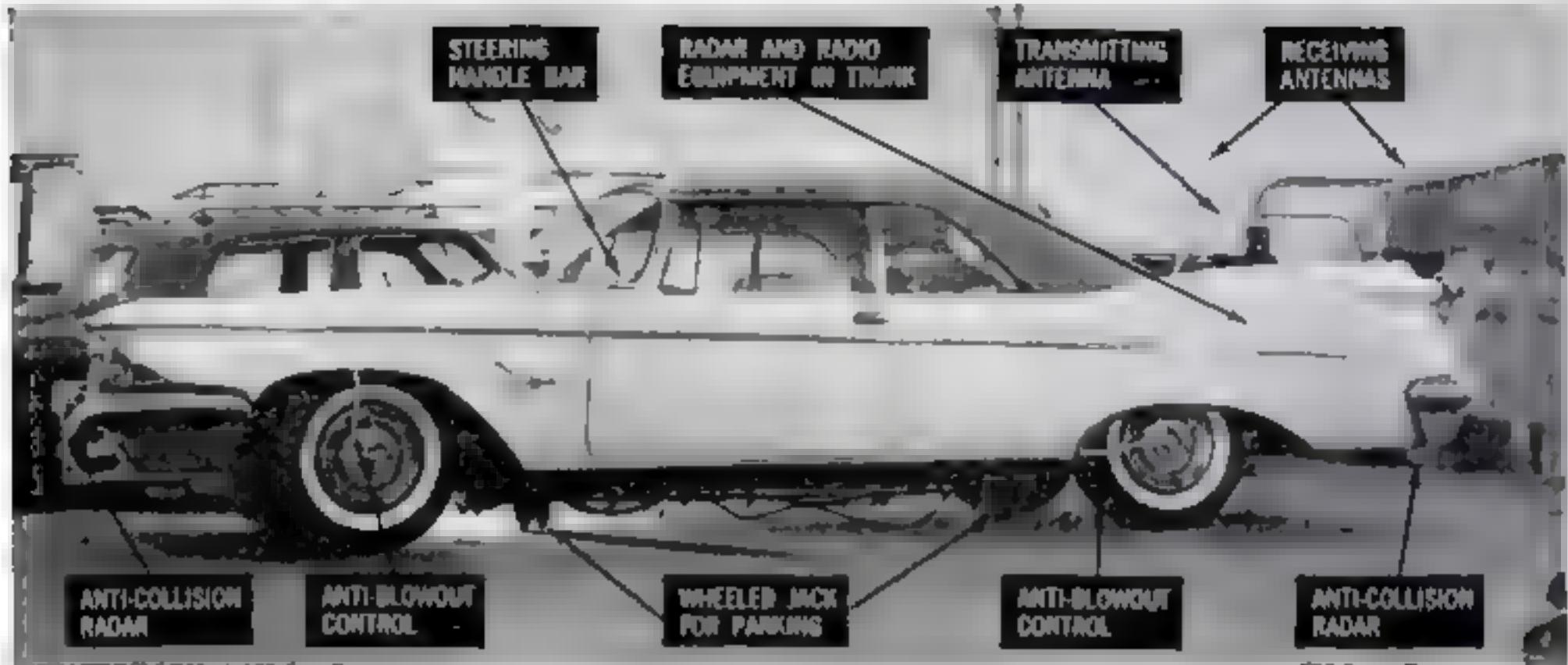
GAS HEATER MAKES ITS OWN ELECTRICITY: A bank of thermocouples in the center of this wall heater developed by Minnesota Mining and Manufacturing makes enough juice to power the warm-air circulating fan and the controls.

the Lone Star Gas Co., Dallas, Tex. It fits neatly into the ceiling and uses a gas-fueled radiant burner for its heat source. A series of 42 thermocouples generates about $1\frac{1}{2}$ watts—enough to power the air-handling fan and, again, operate the automatic controls.

[Continued on page 212]



GAS-FIRED BASEBOARD HEATER feeds an eight-foot tongue of flame through a stainless-steel tube. A direct-vent heater, here's how it looks fitted into an outside wall of a house.



Miracle car has built-in radar and radio controls that make it crashproof and burglarproof.

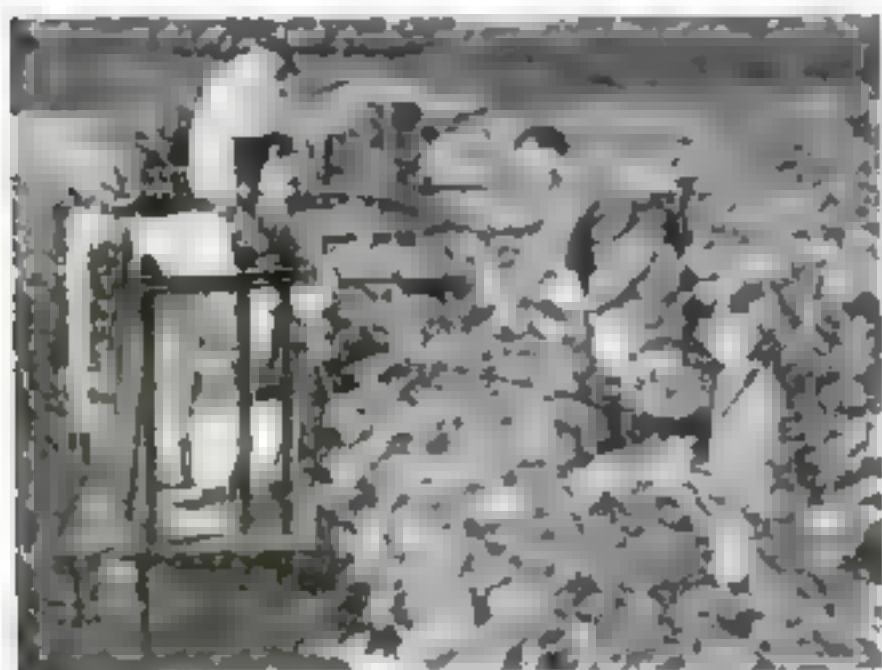
A car that refuses to get into a collision

This Imperial Crown convertible boasts accessories Chrysler doesn't offer. They were built in by a Belgian garageman, Alphonse De Joncker, who picked up some of his ideas while in the U. S. Army during World War II and as a volunteer ambulance driver since for his local Red Cross in Courtrai. Here are some of them:

- Anti-collision radar front and back eases up on gas and applies brakes if the

driver nears an unseen object—particularly useful for driving in fog.

- Automatic controls on each tire warn of air leaks and, in a blowout, disengage brakes on the affected wheel.
- Motorcycle handle bar with accelerator and brake controls in grips replaces steering wheel, eliminating pedals.
- Motorized caster wheels raised and lowered by hydraulic jacks get the car



Motorized grape picker

A grape harvester that can gather up to five tons of grapes an hour has been developed by Cornell University researchers. The gasoline-powered machine, which is operated by two men, shakes the grapes off the vines with vibrating flaps that look like a paddle wheel. A conveyor carries the grapes back to a receptacle.

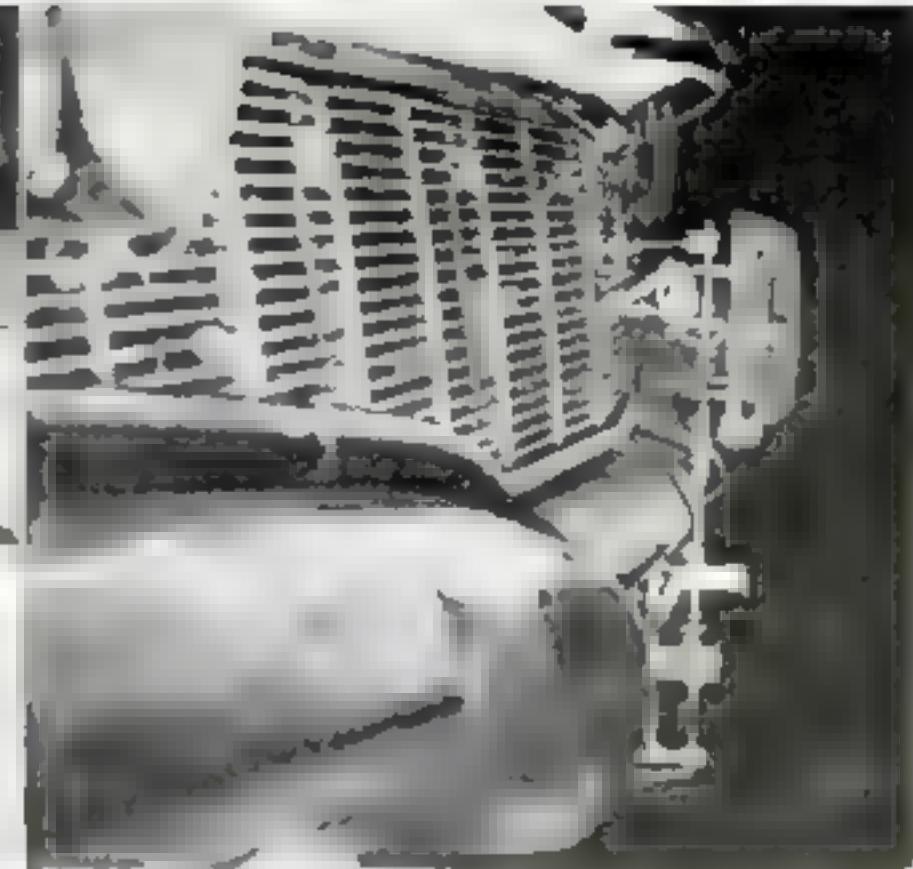


Storm shatters car window

It pays to leave a window in your car open a crack when locking up, as these motorists can attest. When a sudden storm hit Atlanta, Ga., recently and the temperature dropped 20 degrees within an hour, the rear window in this tightly sealed car shattered. Five other automobiles in the area suffered a similar fate.



HANDLE-BAR GRIPS twist for acceleration. Pulling on them applies car's brakes.

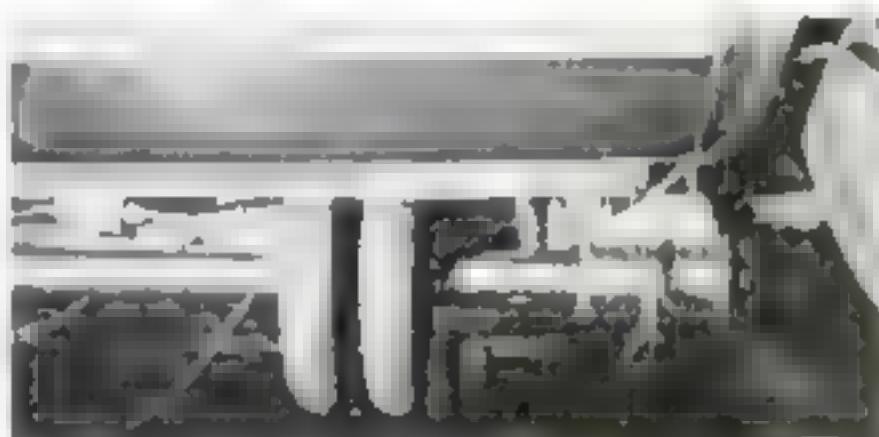


ANTI-COLLISION RADAR, set for any distance, halts car on approaching an unseen object.

sideways into and out of parking spaces.

- Radio controls open the garage door and, when he is far from home, let him start the house furnace, turn on the house lights, and talk with visitors who press the doorbell at his home.

- To protect his considerable investment, De Joncker has installed a burglar alarm that sounds when an unauthorized person gets into the driver's seat. The car can also be stopped by a spoken radio command within a radius of 2,000 feet.

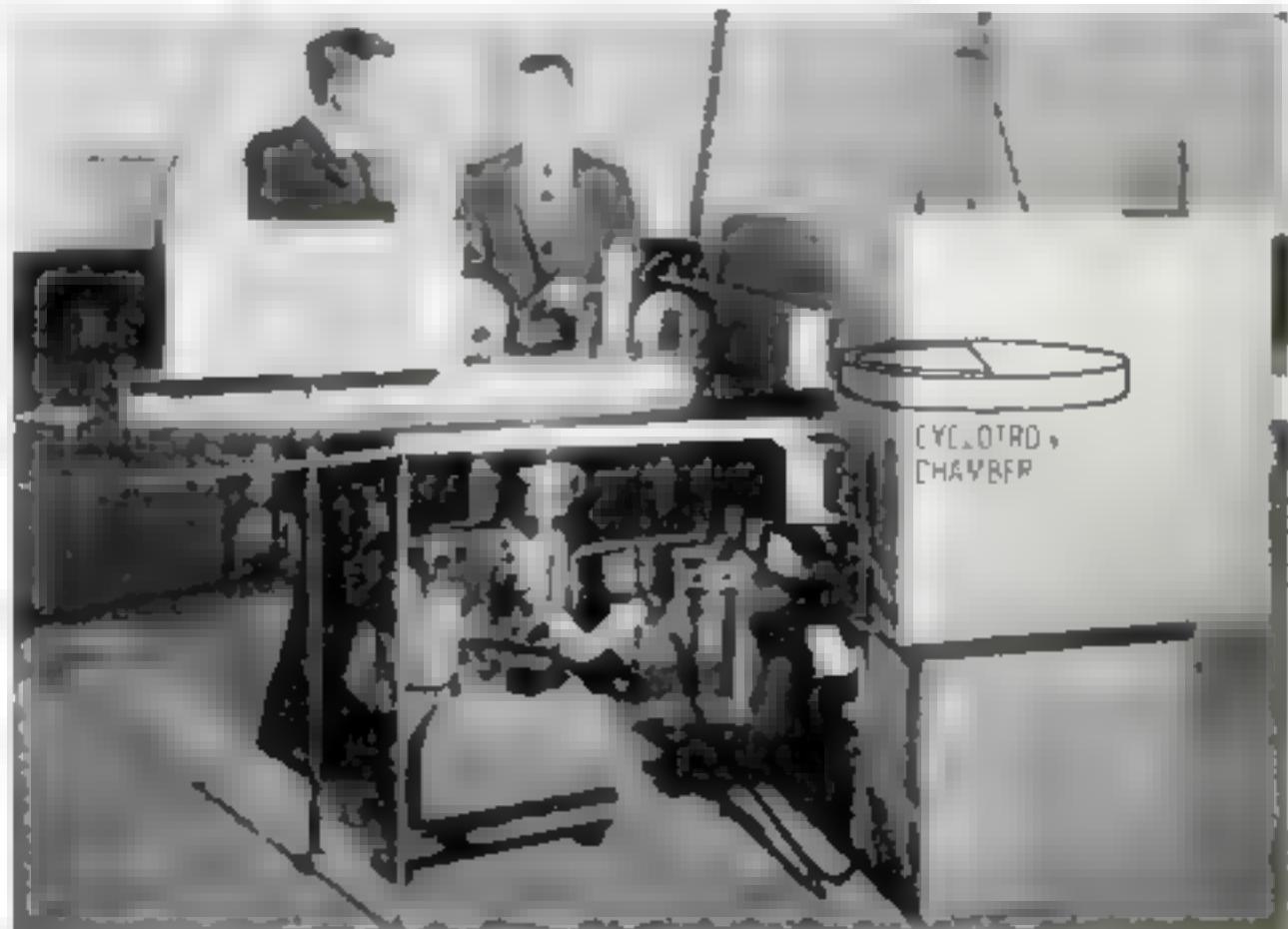


HYDRAULIC JACKS, fitted with wheels run by their own motor, park the car sideways.

Students get atom smasher

Undergraduates learn nuclear alchemy at Pomona College, Claremont, Calif., with a cyclotron designed and maintained specially for their use.

Into the desk-size atom smasher, built by Hughes Aircraft Co., go a stream of hydrogen gas and some 11 kilowatts of electric power. Hydrogen ions are shot into a disk-shaped chamber and whirled to generate a 2,000,000-electron-volt proton beam that bombards targets inserted through a vacuum valve. By exposing materials to this atomic whammy, students can make



them artificially radioactive and transmute one element into another. What's inside the box is sketched on the photo.

POPULAR SCIENCE here presents the second of three articles on Detroit's new compact cars for 1961.

Last month we related our staff experiences with an Oldsmobile F-85 in 10,000 miles of driving. This month we report on 10,000 miles in a Pontiac Tempest, a year's average driving compressed into one month. In less than 30 days, we drove the Tempest through 17 states and two Canadian provinces, in heavy traffic and on deserted lanes.

Like the Corvair, Falcon, and Valiant that we tested last year, and the F-85 last month, the Tempest was bought at full retail price. It was a manual-shift station wagon, with only a heater, radio, and outside rear-view mirror as accessories. The engine, Pontiac's tamest, was a cast-iron four rated at 110 hp. with 8.6:1 compression and a one-barrel carburetor.

Next month: 10,000 miles in a Dodge Lancer.

Testing the New Little Pontiac:

10,000 Miles in a

By Devon Francis

HOW THE TEMPEST DID



THE PERFORMANCE

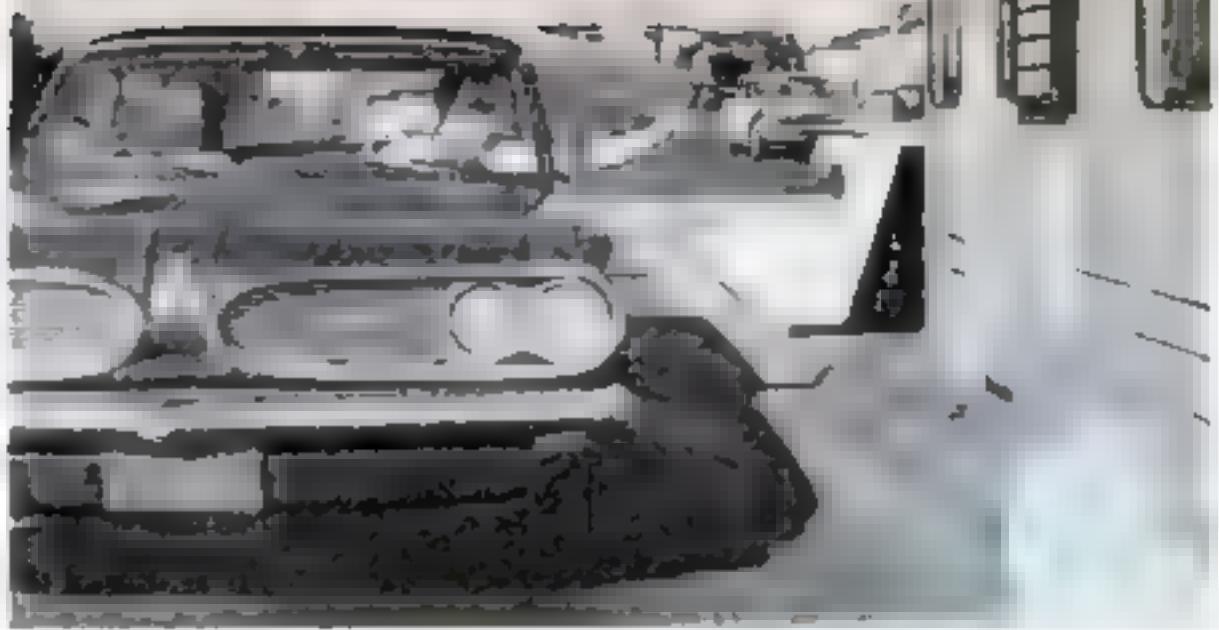
Total distance covered.	10,498 miles
Gasoline used (non-premium)	518.2 gal.
Average miles per gallon	20.25
Oil burned	1 qt.
Gas mileage at constant speeds	
30 m.p.h.	28.4
40 m.p.h.	27
50 m.p.h.	24.9
60 m.p.h.	22
Gas mileage in stop-and-go driving	18.7
Acceleration	
0-60 m.p.h.	13.5 seconds
40-60 m.p.h.	7.9 seconds
50-70 m.p.h.	9 seconds

Top speed	96-plus m.p.h.
Speedometer error	
Indicated Speed	Actual Speed
40 m.p.h.	37.5 m.p.h.
50 m.p.h.	47 m.p.h.
60 m.p.h.	57 m.p.h.
70 m.p.h.	67 m.p.h.

THE COSTS

Gasoline	\$171.06
Oil burned	.50
Gas-oil cost per mile	.0163
Repair and maintenance,	
Including adjustments at 500, 1,000, 5,000, and 10,000 miles	
Oil and filter changes	\$10.44
Lubrication (including draining and refilling transmission	12.00
Total labor	1.20
Total	23.64
Overall direct operating cost per mile	.0186

*Popular Science
Tempest had racked up
2,900 miles by the
time it stopped at
toll booth of Talmadge
Memorial Bridge,
spanning Savannah
River, Georgia.*



*On a Lake Michigan
beach below Benton Harbor car
was tested for its transaxle
traction. It showed no
reluctance in soft sand*

*Heavy rains disclosed
two water leaks at
top of windshield*

*Discovered loose
connection in
ignition. Remedy:
wiggling key*



*Only good brakes
saved the life of a
pooch that ran in
front of the car*

Tempest



*Had to drive at a
crawl for miles.
Trouble: fog. Engine
stayed cool*

*Gas attendant counted
plugs three times. "Is
the Model A back?" he
asked*

*Soft shocks produced
pounding and wallowing
on cowpath-type roads*

*Gas-pump jockey forgot
to replace oil-filler cap.
Oil splattered engine in
fast driving . . .*

*... Pontiac dealer said
sorry, no Tempest caps
received yet. Tried
regular V-8 cap. It fitted*

*Tempest emerges from main gate
at Orton, a pre-Revolutionary
North Carolina rice plantation.*



Taking fast corner on a dirt road demonstrates behavior of independently suspended rear wheels under side stress. Rear end is willing to break loose. With Tempest, inside wheel loses traction, and outside one begins drifting. Drift is easily controlled.

THE Pontiac Tempest is the year's most unconventional new car. As a piece of machinery, it's unique. It's the first U. S. mass-produced 4-cylinder car since Ford's Model A. It's the first car with a front-mounted engine and a rear-mounted transmission in 40 years. And it's the first to have a curved, limber drive shaft.

Our test indicates that it may prove to be as controversial as it is unconventional. Some of its drivers liked it unabashedly. They found it spunky, capable, pleasant to drive. Others gave it a biliary eye: It vibrated, made noises, and was poorly sprung.

The test team, of a half dozen POPULAR SCIENCE staff members of various shades of taste and experience, agreed on some points. The car hums along like a V-8 in a wide spectrum of cruising speeds.

It's economical. It generally keeps its feet in rough going. And it has a tight, well-designed body. Here is our report:

Fuel Consumption

The Tempest's overall fuel economy in more than 10,000 miles of all kinds of driving was 20.25 miles per gallon. A stop-and-go record of 18.7 miles per gallon seemed excellent for a roomy station wagon weighing more than 3,000 pounds.

One surprising finding was that fuel mileage differed so little from that of the 155-hp. V-8 in the Olds F-85 tested last month (see box). Part of the explanation lies in axle ratios. The Tempest has a 3.55:1 axle, the F-85 a 3.08:1. The numerically higher the axle ratio, the more times the engine turns over—the more fuel it uses—for every revolution of the driving wheels.

How the Tempest compared with PS's F-85 and 1960 Corvair, Falcon, and Valiant

	Tempest	F-85	Corvair	Falcon	Valiant
Overall average miles per gallon	20.25 m.p.g.	20.21 m.p.g.	23.43 m.p.g.	26.56 m.p.g.	20.31 m.p.g.
Gas mileage at constant speeds					
30 m.p.h.	28.4 m.p.g.	27.9 m.p.g.	26.8 m.p.g.	30.2 m.p.g.	25.8 m.p.g.
40 m.p.h.	27 m.p.g.	26.8 m.p.g.	24.2 m.p.g.	29 m.p.g.	24.2 m.p.g.
50 m.p.h.	24.9 m.p.g.	24.9 m.p.g.	23.6 m.p.g.	28.1 m.p.g.	23.9 m.p.g.
60 m.p.h.	22 m.p.g.	21.6 m.p.g.	22.6 m.p.g.	27.1 m.p.g.	22 m.p.g.
Miles per gallon in stop-and-go driving	18.7 m.p.g.	15.03 m.p.g.	21 m.p.g.	22.4 m.p.g.	19.6 m.p.g.
0-60 acceleration	13.5 sec.	13.8 sec.	17 sec.	22.9 sec.	17 sec.
Top speed	96-plus	100-plus	88 m.p.h.	78 m.p.h.	96 m.p.h.
Total oil consumption	1 qt.	4 qt.	4 qt.	1 qt.	3 qt.
Gas-oil cost per mile	\$0.0163	\$0.0162	\$0.0145	\$0.0122	\$0.0163
Overall direct operating cost per mile	\$0.0186	\$0.0172	\$0.0184	\$0.0147	\$0.0206

Despite a disparity in wheel sizes—the Tempest's 15-inch as against the F-85's 13-inch—its engine revolutions per mile in high gear number 2,807, or upward of 200 more than the F-85's. Moreover, the Tempest engine has to work harder, for the cast-iron four is substantially heavier than the aluminum V-8.

Handling

Senior Editor Martin Mann, first witness for the prosecution, was unhappy with the gearbox. "It whines," he reported, "like a pickup truck in first and second. It also whines in high when you let the engine brake you down from 50 m.p.h."

He also found the throws on the floor-mounted gearshift too long—"You put your fingers in the ash tray in shifting into second."

To Mann's objection to the use of a floor-mounted shift, Managing Editor Frank Rowsome said: "There's a yes-but, here. The floor location may have been dictated by the rear transmission—to simplify linkage."

Rowsome posed a problem for the distaff side of the family: "Heavy traffic occasionally demands a double shift into unsynchronized low while the car is moving—something few wives can be taught to do. And the accelerator must be handled gently to keep from luggering the engine at speeds below 22 in high."

Editor Howard Allaway, addressing himself to Pontiac's head man, Semon Knudsen, commented: "Next year, please, a synchronized first gear."

Detroit Editor Ken Ferroyle found the steering precise and easy. Others



Tempest soots cautiously to brink of an "overlook" in Virginia's Blue Ridge mountains. Brakes were superb



Only one of the dozen drivers and co-drivers felt impelled to stop and stretch occasionally due to discomfort of seat.



Car loafers beneath a Deep South oak festooned with moss in a rare moment of repose during the 10,000 miles of driving. Transaxle operation normally did not reach the ears, but clanks emerged from it when bottomed on deeply rutted side roads.



Bench drill press and portable power saw are loaded with plenty of room to spare. Compartment is 44 inches wide, 88 long.

agreed up to the point of hard cornering, when several drivers reported a tendency toward oversteering—a tightening of the turn that required backing off on the wheel.

Technical Editor Hubert Luckett said: "You have to press this car really hard to get any actual oversteer. Even then, it's not dangerous. In a moderately hard turn, it does move from understeer to neutral-steer. This can be momentarily alarming to drivers accustomed to conventional Detroit understeering."

"But—and this is important—at high speed, the Tempest doesn't impart that light, quivery feeling that is characteristic of oversteer cars."

The question of road adhesion also brought a mixed verdict. The three hardest drivers found that the rear end could be readily broken loose. "More easily,"

How Well Was It Designed and Built?

Like the Chevy Corvair, the Pontiac Tempest design is a bold, imaginative departure from Detroit's conventional automobiles. In sum, the car is well-built. Like all cars, it has its faults. Here are some:

- The engine and drive train vibrate at some speeds.
- The independently-sprung rear wheels tend to lose traction faster than cars with solid axles in hard turns.
- The front-wheel geometry gives slight oversteer in a hard turn.

How the Tempest's Tires Stood Up

A tire expert measured tread depth at 10,112 miles. Since the 6.50 X 15 Firestones had not been switched at 5,000 miles, four instead of five tires shared all the wear. Each front tire had lost 20 percent of its tread, each rear tire 25 percent. His estimate of projected tire life: a rather remarkable 40,000 on four tires, close to 48,000 on five that were rotated regularly.

said Associate Editor Alex Markovich, "than you'd expect on a car with 50-50 weight distribution."

Everyone liked the brakes. Luckett found none of the oversensitiveness that he had encountered in the F-85. The foot pressure required in hard stops was fairly high, but, he said, that was preferable to the grabbiness caused by excessive servo action. Rowsome added that the brakes did fine in hard mountain driving.

Allaway, capsizing the handling: "I like this car. In fast, heavy, three-lane turnpike traffic, I felt more secure—more in command—than in any other car I've driven in the last couple of years, with the possible exception of the Corvair."

The Ride

Luckett said: "The ride is smooth on good roads. The biggest problem is pitch on wavy surfaces when the wheels deflect at the same moment. The car shows up best on pocked roads, when the springs deflect independently."

To Fermoyle, the ride was comfortable, though "a bit thuddy on potholes." Both Markovich and Rowsome would have liked stiffer shocks. Mann said, "The ride is excellent except at speeds around

- The gearshift throws are too long.
- The ride, in general, is hard.
- Too much road shock reaches body, steering wheel, and shift lever.
- On some roads, the body pitches.
- The one-piece tailgate forbids long loads.
- The seats lack depth.
- The windshield developed water leaks.
- The ignition switch had an intermittent contact.

*Crossing into Canada
for magnificent view
of Niagara Falls,
Tempest drivers were
greeted by customs
officer's query:
"What make of car
is that?"*



50 on concrete. There the asphalt expansion strips do set up a pitch. Evidently there's a harmonic."

Performance

For Allaway, the passing power between 40 and 65 in high gear was all that anybody would want. "In slower traffic," he added, "the performance is spry if you're willing to make use of second gear, as obviously was intended."

Markovich, who strikes the rest of the staff as a frustrated racing driver, said, "High-speed passing on two-lane roads is nerve-racking—there's no guts to the engine in the upper ranges." Hastily, he added, "But once you get used to winding in and out of the lower gears, you get all the snap you want in city traffic."

From Rowsome: "This big, fat four has plenty of torque. If you wring it out, shift late and quick, and keep the accelerator on the floor, you can go real briskly. Even in standard trim, the Tempest will 'way out-perform the Falcon and Corvair.

"Hills and passing are little problem, though the high-speed pass—say, 65 and above—isn't as vigorous as in a big-engined car. I think the top speed—96 m.p.h. indicated—might be bettered some

with a numerically lower rear axle."

The Tempest had ample power for Mann on hills, but the engine lagged badly after a slow corner. Luckett's reaction was a contrast: "Sure, it lugs. It's a four-cylinder engine, after all. But it's beautifully balanced. It spans off one-two-three-four (or one-three-four-two if you're going to get persnickety about the firing order) without a whimper even down to 10 miles an hour in high gear."

Design and Construction

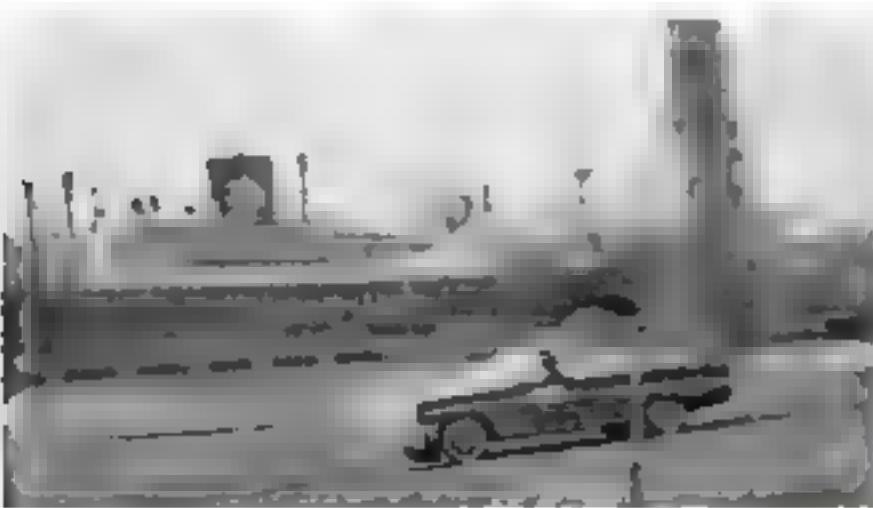
Here the roof falls in on the Tempest's engineers and designers.

Rowsome: "The gearbox and clutch are noisy. You travel with throbs, grinds, pulses, bongs, and chirps. The box is very noisy on the over-run in low and second, and sometimes in high."

Luckett: "An extra source of vibration in this car was the differential, hung on the structure instead of being isolated from it as in a conventional car. The chirp that Rowsome mentions came from the clutch-release bearing—but this is a normal, easy fix under the warranty. The generator whined noticeably, especially in cold-weather starts."

Markovich would have liked a bigger

[Continued on page 216]



*Pacing freighter on Welland Canal,
Tempest easily threaded in and out of
traffic on two-lane roads of Ontario.*



*Miami: Four-banger engine developed
plenty of torque in second gear for
many miles of city driving like this.*



Fire fighters learn smoke-eating art

Austria's volunteer firemen who attend a special school conducted for them in Vienna learn in a classroom session above the art of combating blazes. Using a

model of a typical small town, an instructor explains to them how to fight fires in the different kinds of buildings represented and under varying conditions.



Boeing 727 for short and medium hops.

Vickers Super VC-10 for flying the Atlantic.

Jet power for new airliners goes to rear

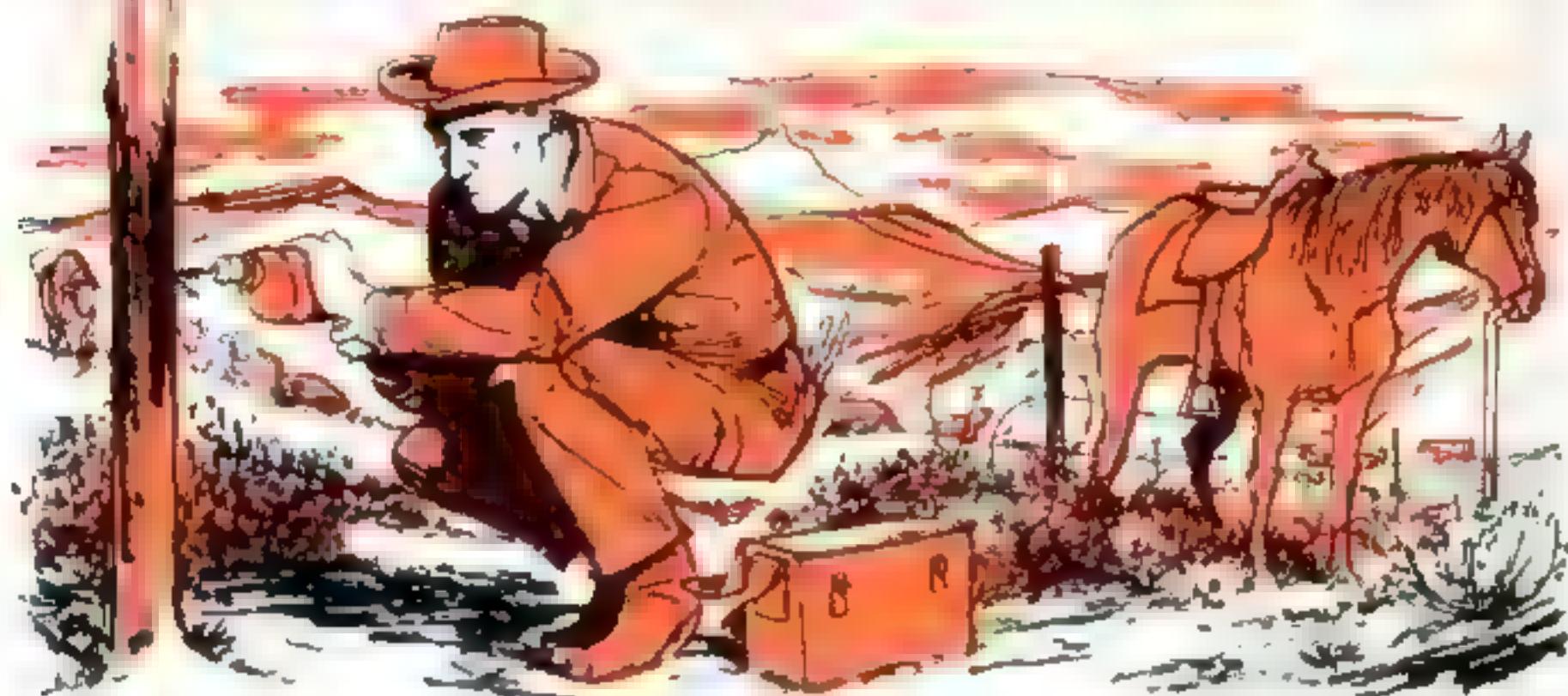
Next jet airliners will have engines in their tails. This gives more lifting power on shorter runways and makes the ride quieter for passengers. Both Boeing and British Aircraft Corp. follow the lead that France's Caravelle took several years ago, but they'll put jets smack in the tail, not just toward the rear.

Boeing will build 80 of its new 727s for two airlines: Eastern and United. It uses three jets—reminiscent of the old Ford tri-motor airliners of the 1920s. It

has jets in the tail instead of props at the front. Two jets will be fastened to the sides of the tail, one on top. Of short and medium range, the plane will carry up to 114 passengers at 600 m.p.h. It will appear in 1963.

British Overseas has ordered 35 Vickers VC-10s for 1963 delivery and 10 Super VC-10s for 1965. The Super 10 is a stretched version of the standard, will carry up to 187 passengers, or 212 in economy class, in transatlantic flight.

"I'd like to see them make..."



BATTERY-OPERATED DRILLS for jobs far from a power source. You'd beef up its rechargeable

battery at an outlet before heading for the work site.—B. W. Pierce, Norwalk, Ohio.



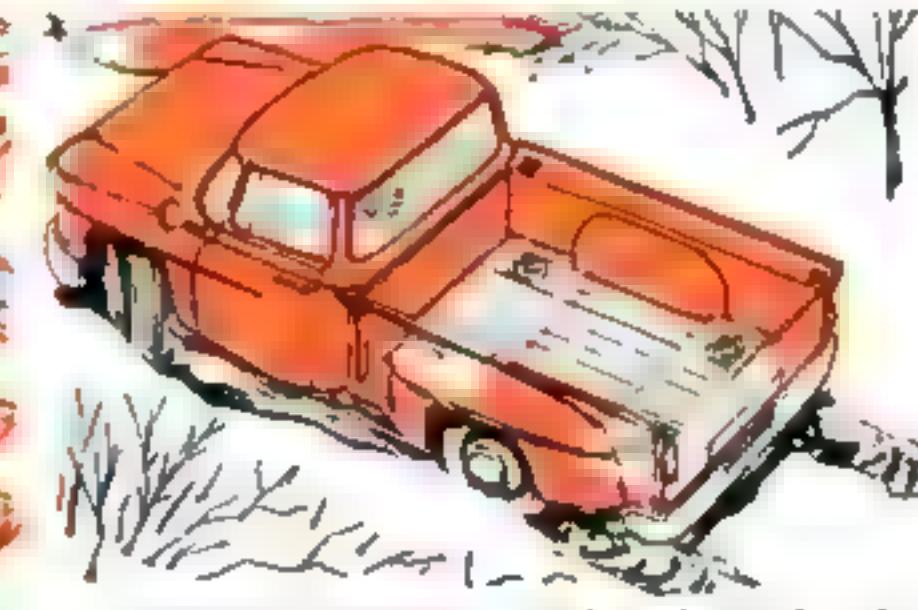
A POOCH-DRYING "TENT" to replace the hood on the warm-air blowers women use on their hair. It would dry a dog after a bath or a walk in the rain.—W. Ronson, Jamaica, N.Y.



A MAGNETIC BELT to hold nails and small parts for a man doing odd jobs around the house. For women, one to hold straight pins or bobby pins.—Muriel Carey, New Castle, Pa.



COOL-TO-THE-TOUCH electric irons with all outer parts except the sole plate cast in one piece of an asbestos-cement and fiber-glass composition.—S. L. Steigman, Howard Beach, N.Y.



FOR BETTER TRACTION, metal tanks under the beds of pickup trucks. You'd fill them with water. A drain plug would allow emptying when desired.—W. F. May, Crestwood, Ky.

Everyone has his own pet idea of a gadget that he would like to see in general use. The five ideas illustrated above were suggested by POPULAR SCIENCE readers. What's

your? We will pay \$5 for each one published. Please use Government postcards only. Write name and address clearly. Contributions cannot be acknowledged or returned.

The Show Goes On ...15 Feet Under Water



By Gordon P. Manning

A THIRD of the way down the Florida peninsula, on the Gulf side, the world's most unusual theater has just been opened. Seating 400 spectators, it's 15 feet under water.

They're as dry as toast. But the actors aren't. They swim about in a spring-fed lake. Separating actors and spectators are 19 giant picture windows, each 2½ inches thick.

That's only part of the weird goings-on. The actors come "onstage" seemingly from the bottom of the lake, and depart the same way.

All this took some doing. Like the hull of a ship, the big auditorium wants to float. It had to be anchored down. A way had to be found to get the performers—mermaids—down to a water depth that would pop them in front of the picture windows from below.

How engineers solved the problems of their underwater theater at Florida's Weeki Wachee Springs is shown in the accompanying photographs.

Mermaid makes eyes at you through a glass window in submerged playhouse. Fish-tail model wiggles in time to liltin underwater music.

How they built the world's

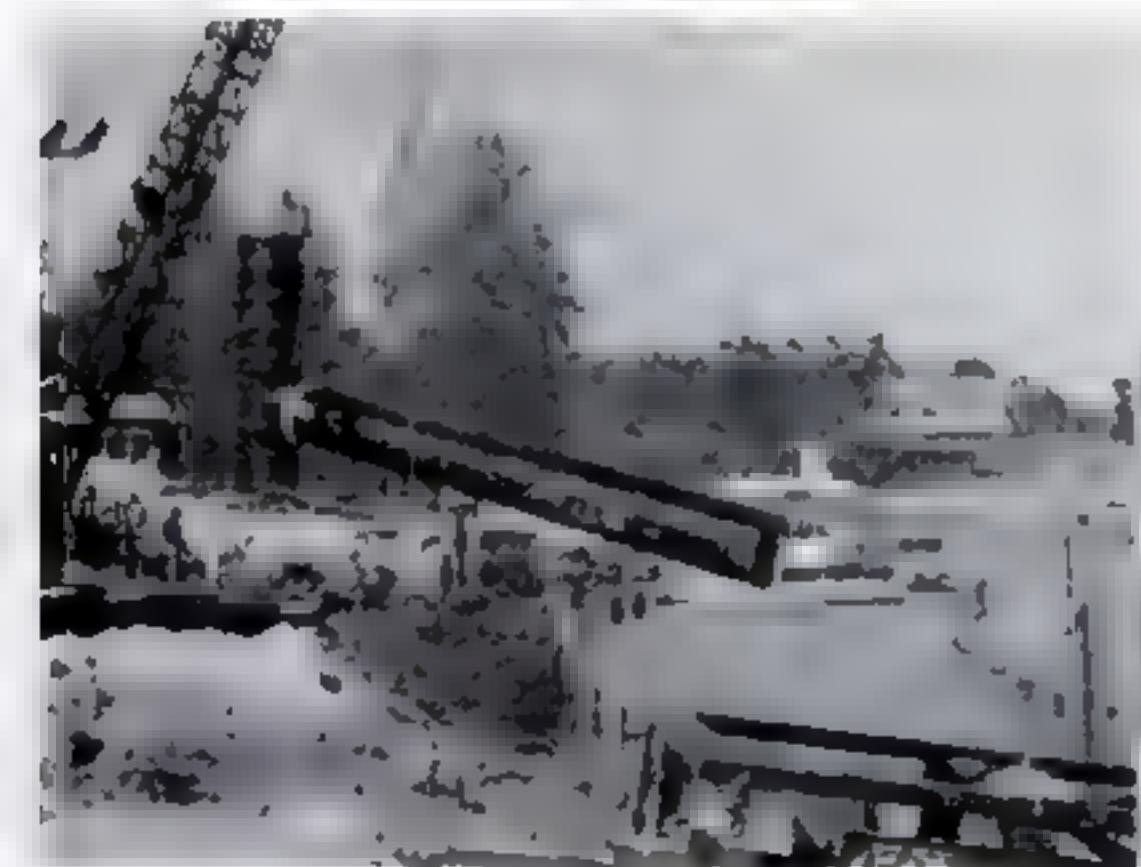


I Underwater theater rests on top of 51 steel piles sunk down 125 feet. Here H-beams are being power-driven into place.



Necks are craned as a seated audience of 400 people watches the underwater spectacle at Weeki Wachee in Florida. The air-conditioned luxury auditorium gives viewers an intimate peek into the deep

first submarine theater



2 Entrance tunnel for the performing mermaids, a 60-foot-long pipe, is lowered into place before the main prefab sections are set

3 Prefabricated steel sections of the auditorium, each weighing more than 17 tons, were trailer-hauled to the installation site

CONTINUED



4 Big windows are made of shatterproof glass. Tilted to avoid reflection, they are set in panels 15 feet wide, 17 feet high.

5 Divers were used to bolt and then weld 5/16" steel sections together as in a ship's hull. Neoprene gaskets make temporary joints



8 Hardened steel rods—there are 51 of them—hold the submarine auditorium down tightly. They go 40 feet down, are anchored in concrete

9 Pumped out for the first time, the giant undersea balcony stays put and dry. Contractors had their fingers crossed as the test was made.

11 One year from start, last edge of the roof is being readied for concrete-pouring. The theater's top alone weighs 125 tons

12 Scaffolds were brought in for roof plastering. Here you can see slant of window glass that gives the audience a nonglare view of the water show





6 Final section of the 125-foot theater hull is dropped into place. A track mounted crane was used to handle the big steel panels.



7 Divers take a breather between underwater welding chores. Top of steel hull comes above surface so that theater can be pumped dry.



10 Concrete work is being finished—400 tons of it just for the theater floors. Workmen at left in the photograph are preparing forms for pouring the lobby and entrance ramps.



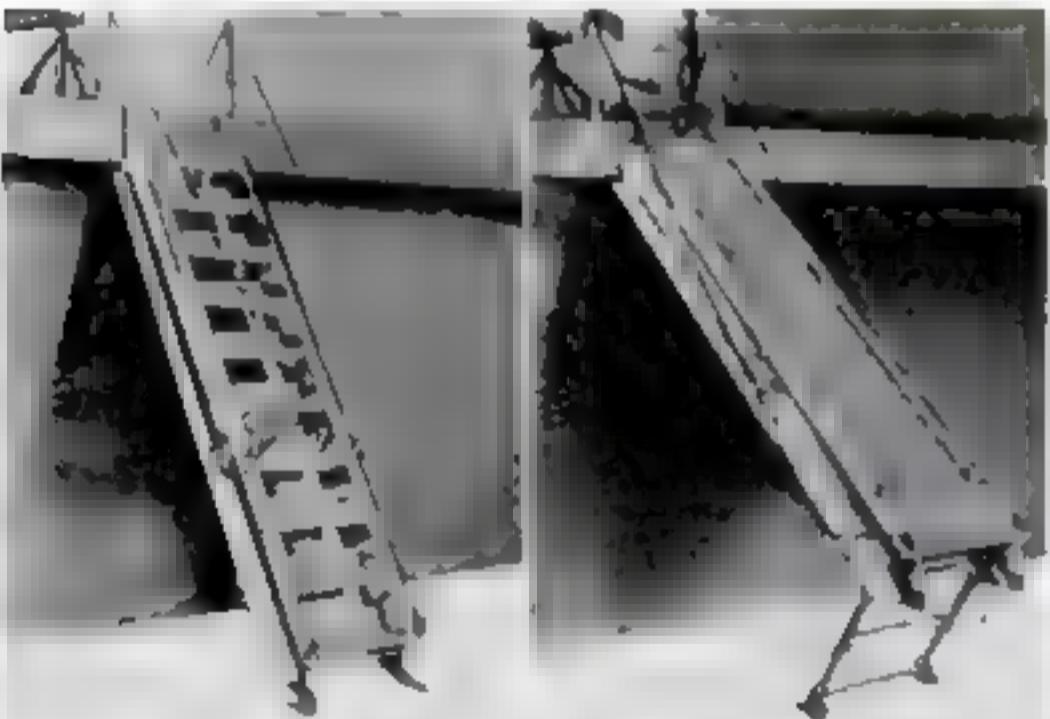
13 Florida's underwater theater is finished—700 tons of submersible steel—an anchored bathtub that holds an audience snug and dry.



14 Fifteen feet under water, this hotel theater features a show of merry mermaids mingling with nature's denizens of the deep.

**9,000 antennas**

This huge radar contains nearly 9,000 antennas under its slanted screen. They enable the ESAR (short for Electronically Steerable Array Radar) to sight a wide expanse of space and to track hundreds of targets at the same time without turning its head. The radar was built by Bendix for the Air Force and Advanced Research Projects Agency. It is in operation at Towson, Md.



In ladder position.

In chute position.

Stairway has dual purpose

An aluminum ship ladder that will also slide supplies from deck to deck is being tested by the Navy. With a flick of a lever, it is transformed from steps for personnel to a chute.

**Pistol-packin' mama**

The fastest electric gun in the East, this Boston plant worker uses a holster to hold her solderless wire connector while she wraps wires onto terminals in an electronic computer for Minneapolis-Honeywell. With 1.4 million wire connections, the computer makes up to 40,000 calculations per second.

**Ping-pong eyes**

With her eyes cupped by halves of ping-pong balls, this University of Michigan graduate student can't see a thing—except color and brightness. Using this device, university researchers have established that, although they can't distinguish lines or shape, eyes are still sensitive to changes—like looking into a dense fog, heavy snow, or sky from a high-flying plane.

**There's more phony green
on the scene than ever,
so be wary—or be sorry**



Counterfeiting: A Tough Way to Make Money

By Joan Steen

MAKING money—in private competition with the U.S. Treasury—is all but impossible. Yet the number of ink-stained souls caught printing or passing bogus bills every year is surprisingly high. And getting higher. There were 412 arrests on counterfeiting charges in 1960—20 percent more than in 1959. New issues of counterfeit notes—ones not matching any on record—were up 26 percent in the same period. And phony money estimated to be in circulation has more than doubled in the last five years—from \$107,000 in 1955 to over a quarter of a million dollars now.

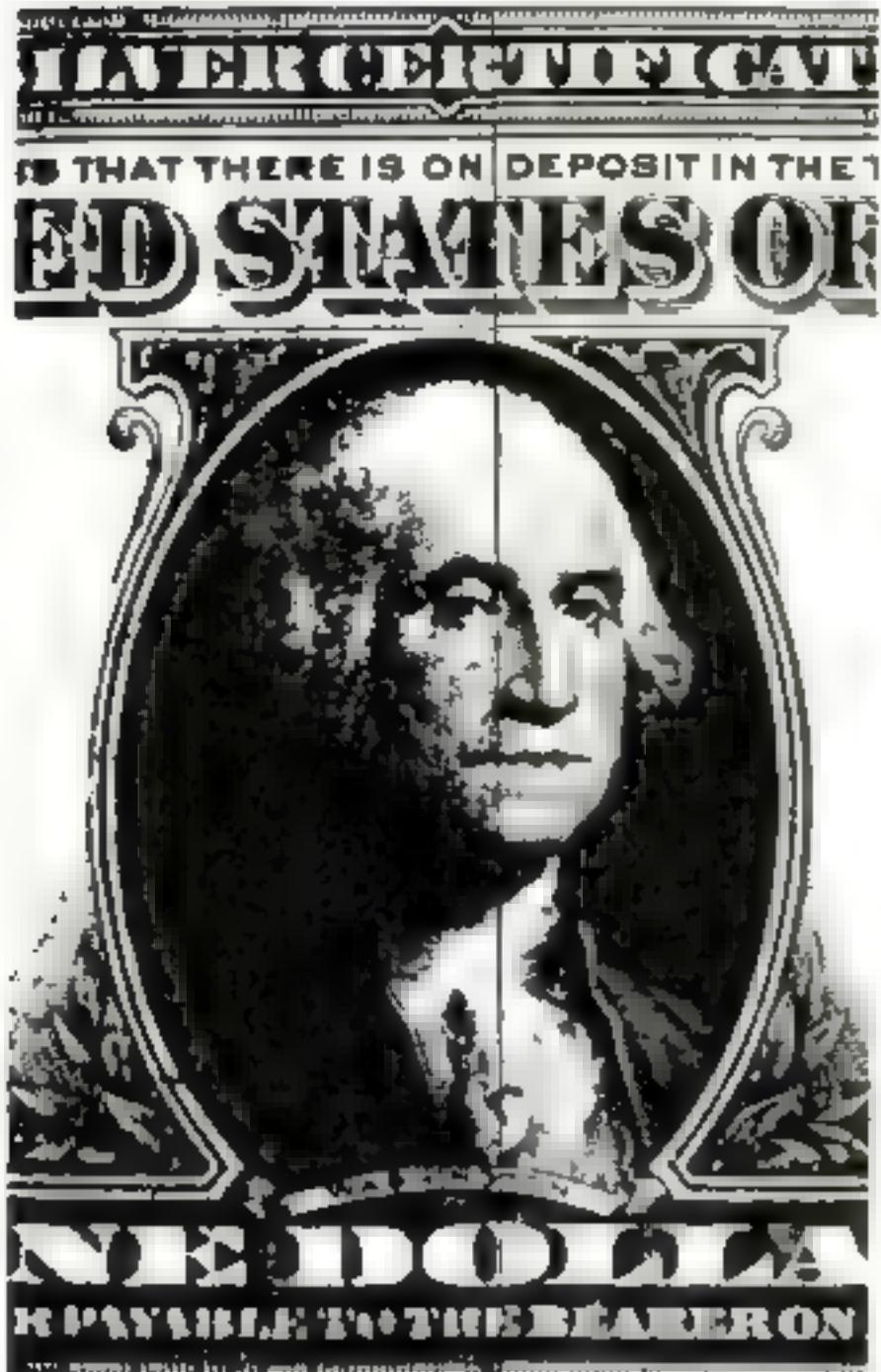
You may have passed a fake bill without knowing it. If you had looked twice, however, you might have spotted it. For

while the latest crop of false money-makers are using slicker methods, their products are almost sure to be only feeble facsimiles of the real thing. The reason: too many government-planned obstacles to overcome.

- The paper the Treasury Department uses is a blend of cotton and linen fibers made especially strong, durable, and flexible. Scattered through it are telltale red and blue fibers, a distinctive earmark counterfeitors often don't even try to cope with.

- The same goes for the ink. Its formula is secret and its production controlled—inside the Bureau of Engraving and Printing itself. There huge batch mixers blend pigments, binders, and extenders to make ink that's as quick-drying, nonfading, and permanent as possible.

Counterfeiting is big business—professionals aren't after

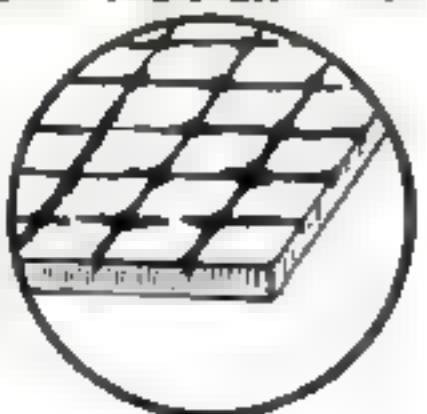


HOW THEY COMPARE: Bad bill on the left is easy to spot when paired with a bona fide specimen. Note the smudged, flat effect; too-heavy use of ink; unclear border details.

This is counterfeit



PHONY INFERIORITY is revealed in this close-up. Under magnification the bad plates show irregular and broken lines. The printed results are dull and scratchy. The portrait tends to merge with the background.



• But the plates themselves are the real stopper. Not only does the Bureau hire some of the country's best engravers, but it also insists that each work only on a particular specialty—portraits, lettering, or scrollwork. No one man engraves a whole plate. To cut the complex border design on bills, elaborate geometric lathes are used. The diamond points make faultless, even-pressure cuts.

Yet counterfeiters grow and multiply. Are they, despite all precautions, getting better? Is money easier to make?

So it seems. Counterfeiters are a strange breed, challenged almost beyond belief by the task of making money of their own. And now there are new techniques to help them.

Sharper cameras. Bureau analysts point to today's top-notch cameras. They say that about 90 percent of the off-green stuff in circulation has been printed from photoengraved plates that are getting impressively more detailed. Sure, the offset-printing results are duller and flatter than the Bureau's own "three-dimensional" intaglio process (where the paper is forced at 100-ton pressure onto ink-filled grooves of the press plates). But the phonies are good enough to pass.

That's the trouble. Counterfeiters count on carelessness. They figure the average citizen won't notice Hamilton's

This is real



EXPERT ENGRAVING in genuine bill makes portrait stand out from the oval background. The eyes appear lifelike. The fine etched lines show up even in the dark areas. The background screen of crossed lines is uniform.



the change from a fake ten-spot

smudged neck, or the buck-tooth gaps in the edge of the Treasury seal. He might even accept a bill with the wrong portrait on it. (Do you know whose picture is on a \$20 bill?)

But sooner or later the fake turns up in the offices of the Secret Service in Washington. There it is put through an analytic mill, photographed, and a fact card describing it sent to all banks. That's automatic. Then comes the tough step—tracking down the gang.

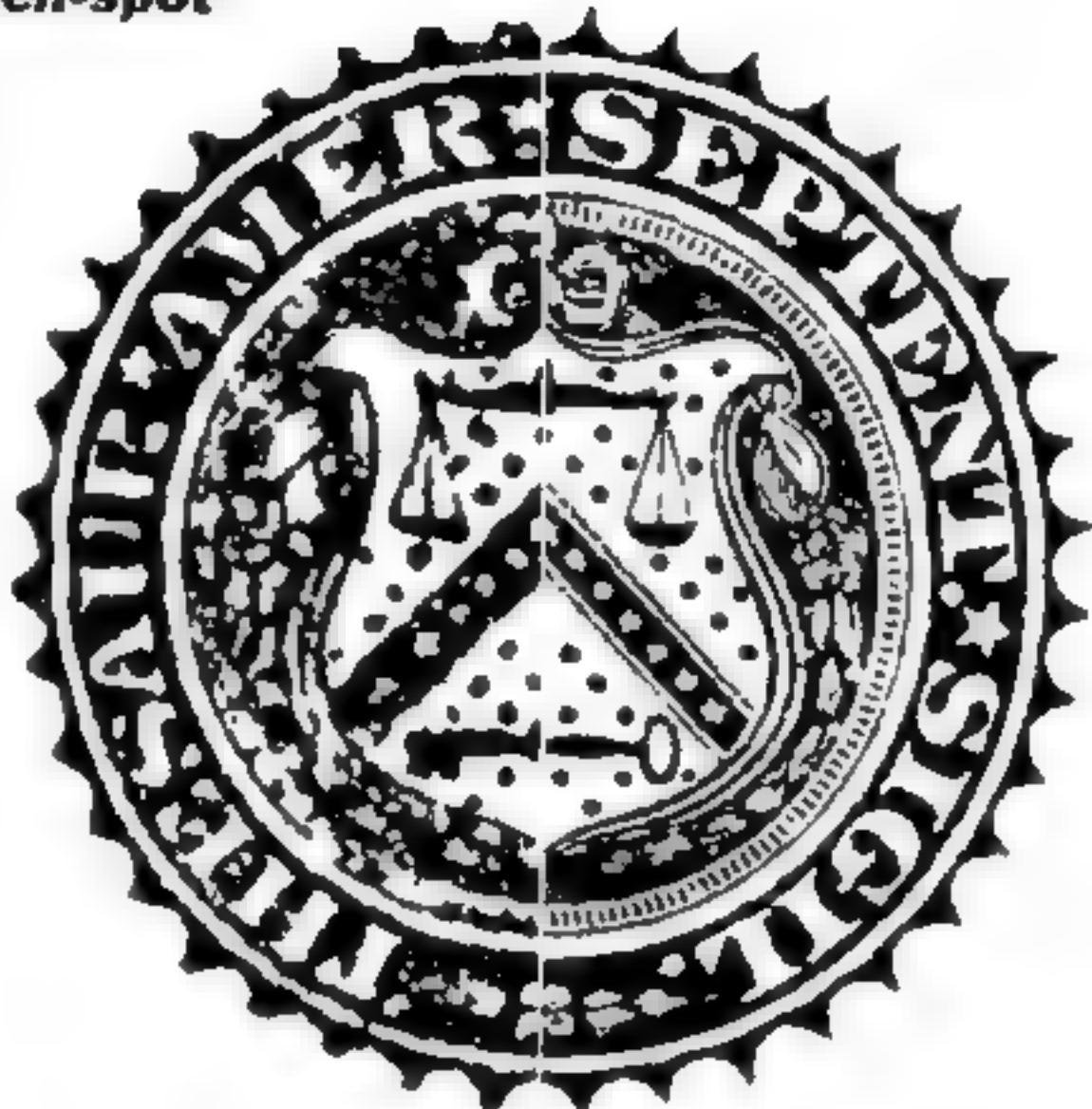
Secret Service agents may get a break in tracing the paper used. That happened in the Riadon-Byars-Fulcher case.

Late in 1957 a flurry of phony tens and twenties (the most popular counterfeit denominations) showed up in Chicago and Indianapolis. Chicago agents found a watermark on one of the bills, traced the paper manufacturer, and started checking purchasers. The tedious business paid off when the agents learned of two men from Memphis who had bought paper, printing machinery, and a large camera.

Meanwhile note passers were being picked up in Nashville, Atlanta, and as far south as Bartow, Fla. Then a tip-off came of a distributor in Memphis—John Riadon. An undercover agent, posing as a criminal interested in buying large quantities of notes, arranged to fly with Riadon to Nashville where, he assured Riadon, another good customer would be waiting.

The second customer was, of course, another agent. He arrested Riadon in the act of turning over \$72,000 at the airport. John Byars, long-time bootlegger and financial backer of the gang, was then picked up. He was one of the Chicago paper buyers. The press was found in the Tennessee backwoods farmhouse of the third gang member, Richard Fulcher, the other paper buyer.

T-Men circulate, too. Solving a case



CREASE A SUSPECTED BILL through the Treasury seal and match it with a real bill for a quick check. Here the phony ten on the left shows irregular and broken saw-tooth points.

like that is like working to the center of a spider web from a flimsy end strand. Between the local hoodlum who tries to pass the first bill, and the organized gang at the center, lie months of tangled investigation that may fan out across the country. Any of the 300 Secret Service agents may be called on to pose as criminals, to work their way through an underworld of "middlemen" until they reach the counterfeiting source, where the big money lies.

For much counterfeiting is big business. The professionals who back it aren't out to peddle for the change they get from a phony ten, but to sell notes wholesale—in lots of 50,000 or 100,000 dollars.

So counterfeit money may stay in circulation long after the press has been seized and the counterfeitors jailed. In the Riadon case, 51 arrests were made, and \$153,000 seized—two-thirds of this before it had a chance to circulate. But some of that money is still around.

Pushing the C-notes. Thirty-five arrests is the score so far in another big case still on the books. This time the counterfeits were \$100 notes discreetly offered for sale in criminal circles.

An undercover agent picked up the source early in the game, but not before large quantities of notes had changed hands. In the next few months they turned up from coast to coast and even in parts of Canada. Hundred-dollar bills are not as hard to circulate as you might think. Stores often accept them rather than offend a customer by close checking.

So it was that two well-dressed women were picked up in one of Houston's fashionable department stores. Professional modeling experience had worked in their favor until the Secret Service sounded the alert.

Secret Service men roamed the country. One posed as a representative of a foreign crime syndicate and picked up \$300,000 from a Chicago distributor. Other agents netted hoodlums in Miami, an ex-prize fighter in Washington, D. C., and, in one nice haul, a St. Louis gang that had bought \$5,000 worth from a convicted burglar, "Willie the Hipster" Harris.

Little guys, too. While such major moneymakers are the prime targets for the Secret Service, they're kept busy by a host of small-timers too.

Some print notes as crude as the smeared and toothless George Washingtons fed to an unsuspecting public a few years ago by a mild-mannered old man known as "Mr. 880."

Others, not equipped to print their own, try their hands at bill-splitting—slicing the two faces of a bill apart. With paper .004 inch thick, this is a delicate dissecting job. The trick is to paste the split halves of, say, a \$20 bill to the split halves of a one. The result is \$40 worth of illegal tender for the price of \$21. Risky? You'd think so.

Another trick is to bleach out part of a bill and then mark it up. One freak

on file in Washington is a Jefferson \$2 bill phonied up to \$500.

And occasionally a fake comes along that's so handsomely done it sends disquieting twinges down the spines of specialists. Then it can be compared to some of the masterful specimens turned out at the end of the last century. In that heyday of American counterfeiting, more than one gifted craftsman felt inspired to outdo the government.

Such a man was Emanuel Ninger, a New Jersey farmer. No engraver, Ninger hand-copied bills. He bought the best bond

paper, soaked it in weak coffee (to give the lucre a properly filthy look), and, while it was moist, made a faint pencil tracing of a real bill. Then, with the pride of a medieval scribe, he inked it in. The results were works of art—prized now as collector's items worth more than the fake face value.

But even he couldn't compare with Arthur Taylor and Baldwin S. Bedell—the brashest pair of counterfeiters the world has ever seen. Early experts in the art of photoengraving, T & B once produced hundred-dollar silver certificates so convincing that the

Treasury Department was forced to call in every such note in circulation and destroy its own plates.

But genius like that is rare. Today the threat comes from machines. To combat it, the Bureau of Engraving and Printing's Research and Development Department works full time. Schemes to frustrate the most skilled photoengraving equipment are evaluated. But when the researchers are not evaluating such schemes, they produce a constant flow of minute but important changes in the present currency which—understandably enough—they don't tell anyone about.



Who's on What? Can You Match the Man with the Money?

Answers: Washington on \$1; Jefferson on \$2; Lincoln on \$5; Madison on \$10; Jackson on \$20; McKinley on \$50; Cleveland on \$100.



Space-age phone

This phone booth looks like a rocket ready to blast off into space from its launching pad. The 18-foot structure was modeled by telephone-company engineers after an actual rocket and installed in a Modesto, Calif., children's park.



Into the rosebushes . . .



. . . plowing its way through . . .



. . . out at the other side—but slowly.

Crashing among the roses

To test the value of fast-growing multiflora hedges as road dividers, the Connecticut state police sent a Dodge Dart hurtling through a row of four-year-old bushes on Wilbur Cross Parkway. The results are shown above. At 30 m.p.h. and a 15-degree angle, the car was slowed to 15 m.p.h.; at 35 m.p.h. and 10 degrees, to 10 m.p.h.; at 30 m.p.h. and five degrees, it was cut down to five m.p.h.

Highway authorities think a double row of more mature roses would be just about perfect. They cost less than a dollar a foot to plant compared to from \$4 to \$5 for steel rails or reinforced concrete.

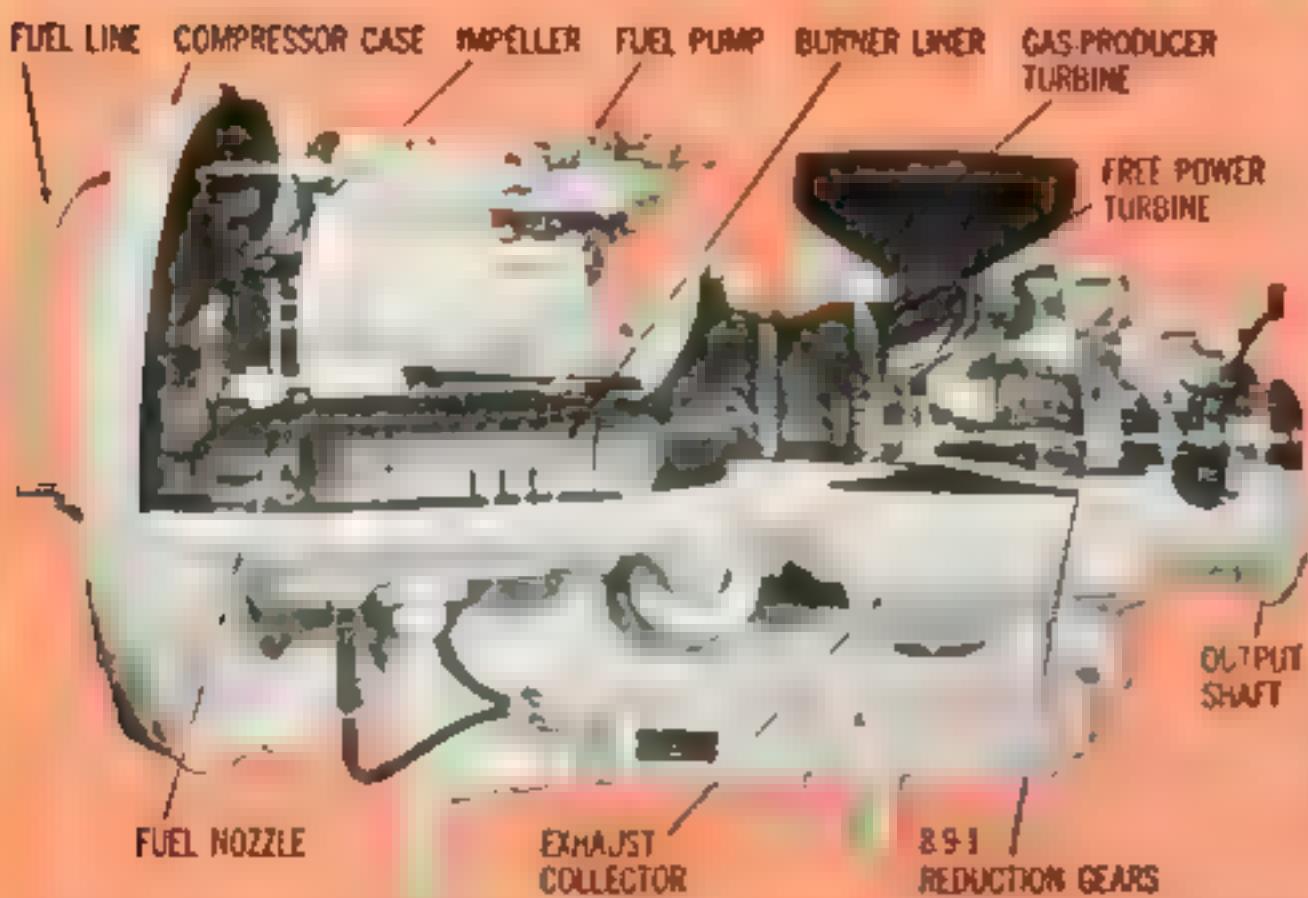


STEEP HILLS ARE COMMON in San Francisco, but the Fire Department's new turbine pumper,

screaming like a banshee, climbs them faster than any conventional fire engine in the city.

Electric Turbine Drives Steepest Fire Pumper

How the Engine Works



GAS TURBINE operates in a simple continuous-combustion cycle. The impeller pulls in air and compresses it. The air is mixed with fuel and the charge ignited by a glow plug to power the gas-producer turbine and maintain the compression-combustion cycle. On the Boeing 502 there is no mechanical connection between the gas-producer turbine and the free power turbine. Hot exhaust gases turn the free power turbine, which is connected through reduction gearing to the output shaft.

San Francisco's new pumper with pint-size engine outpumps, outclimbs, outruns all rivals

By Wesley S. Griswold

(Continued from page 104)

THE smoke-eaters of San Francisco are busting with excitement over a whining, howling new pumper they've recently acquired.

"It's a real bomb," exclaims Fire Chief William F. Murray with a wide grin. "It can pump 2,000 gallons a minute at 150 pounds' pressure. And more than half that volume of water at 300 pounds' pressure. That's terrific."

When this scarlet-and-chrome beauty recently whooshed past astonished street crowds in the singularly hilly city beside the Golden Gate, it was the only turbine-powered fire engine in the world.

By now, there should be two of them. Seattle, another city of demanding hills, is scheduled to take delivery of the second one as this magazine goes to press.

The two revolutionary fire-fighting vehicles have identical engines. Their only difference is in body style. San Francisco's pride is a 26,000-lb. pumper. Seattle's joy is a 31,500-lb., 100-foot aerial-ladder truck.

American La France, venerable builder of fire trucks, produced both of these heart-stirring newcomers. Less expectedly, their engines were made by the Boeing Airplane Co.

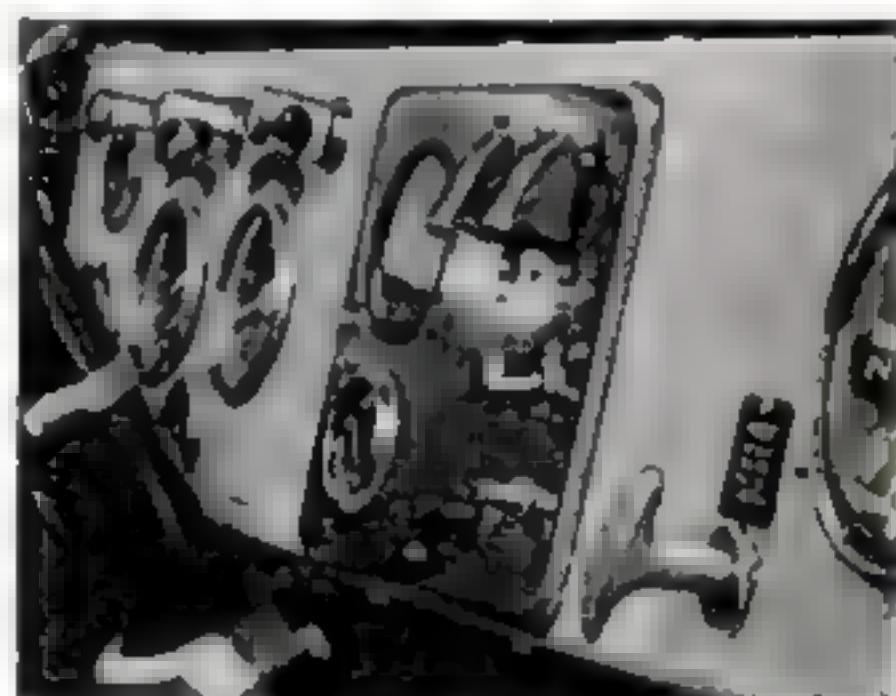
In motion, the trucks sound like a barely muffled jet plane on the loose. Yet, for all the ruckus, they make less commotion than a standard pumper on the way to a fire. The noise is just different—the roar of a forced burner mingled with a bray like that of a gale blowing through a hundred keyholes.

There is a gale in each truck's innards. At full power, air screams through the turbine engine and out the exhaust at the rate of four pounds per second.

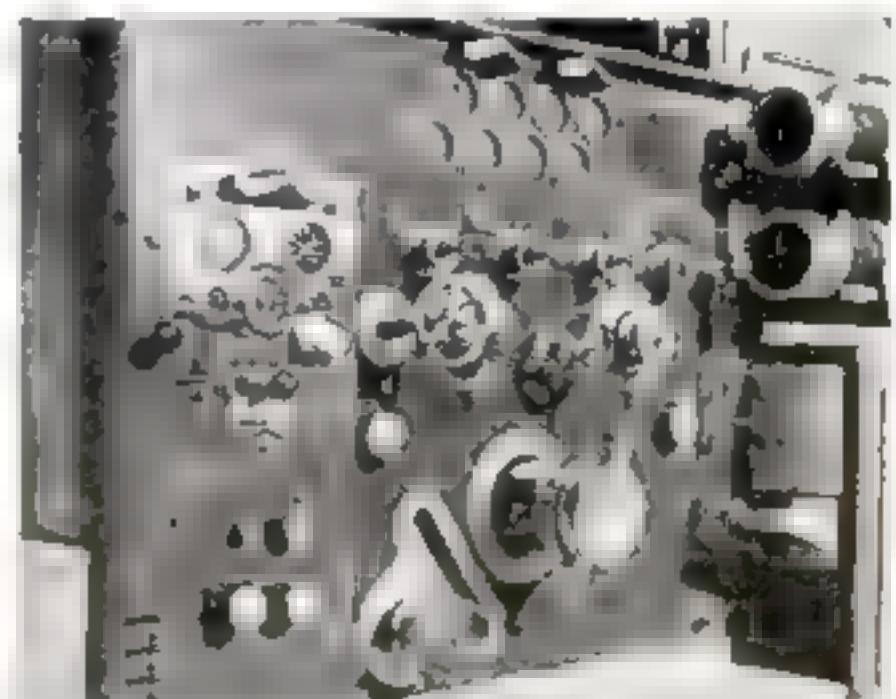
The profile test. There's only one visual feature that quickly distinguishes the two turbine-powered fire engines from all others. That's a fat, low, rakishly angled exhaust stack, glistening with chrome plate and looking like the funnel of a small yacht. It juts up behind the driver's seat, gleaming like a subdued searchlight.



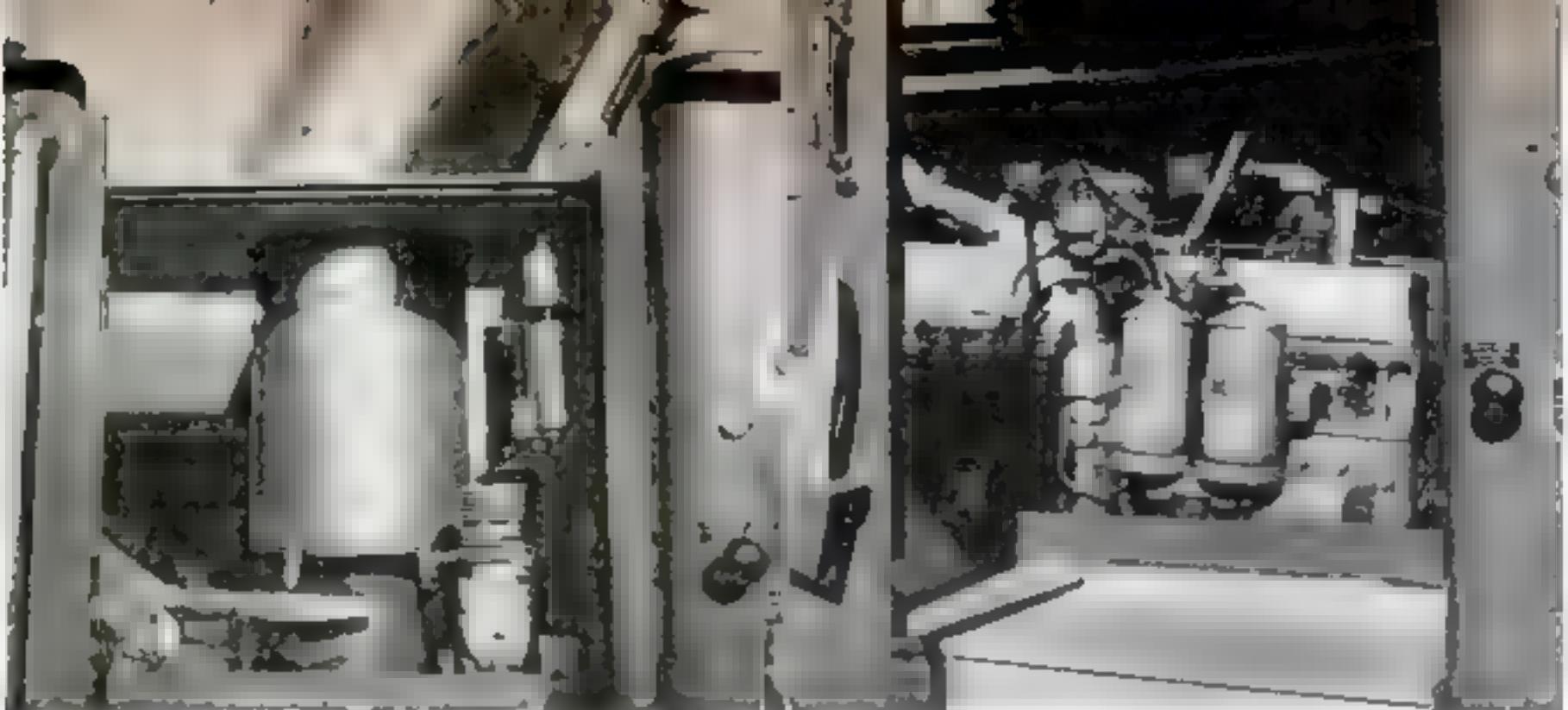
TWO NEW DIALS ON THE DASH are the large ones with dark faces and white figures. One (left) records the revolutions of the gas-producer turbine, the other those of the output shaft.



BESIDE THE STEERING POST is the starter panel. The hooded switches at top are for manual starting in case the automatic system fails. On the panel there's also an exhaust-gas temperature gauge. If this indicates too high, it's a sign of trouble inside the engine.

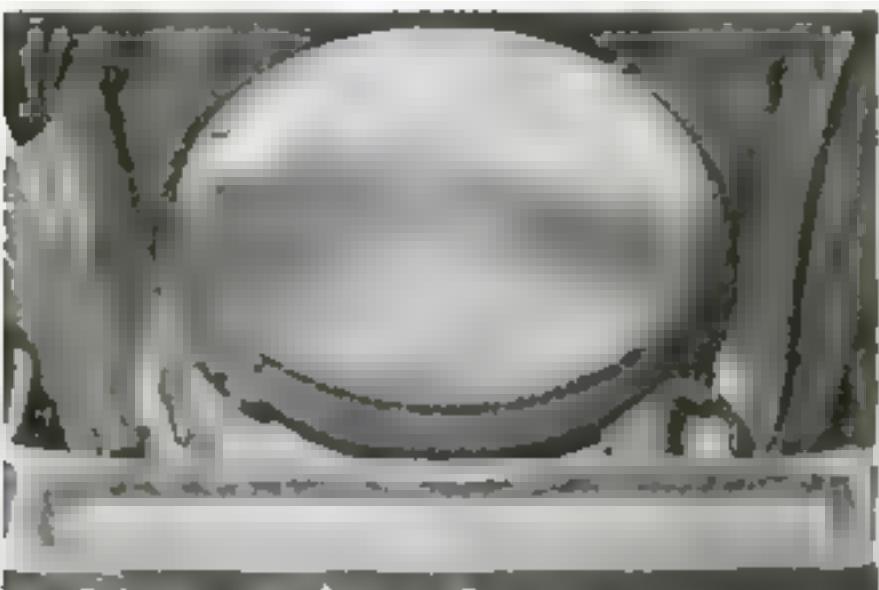


ONE BRAND-NEW DIAL (arrow) on the otherwise standard instrument panel on the port side records output-shaft revolutions. Crew of the turbine-powered pumper must watch the revs to know what volume to expect from the pump.



STRIKING DIFFERENCE IN SIZE between the 330-hp. turbine engine (left) and the six-cylinder, 330-hp. piston engine of a conventional pumper is shown in these comparative photos. The en-

gine compartments of the two vehicles are identical. Back of the turbine's exhaust is the hose pump. Turbine's tear-shaped stack is a protective sheath around the actual exhaust duct.



AT FRONT OF ENGINE, viewed here from underneath the pumper, are the air intake and impeller-silencer. The circular silencer is lined with fiber-glass, covered with perforated sheet metal. The impeller sucks in air through the mesh screen around the rim of the silencer.

The slant of the stack suggests speed, and that is available in abundance. San Francisco's new pumper has been clocked at 60 m.p.h.—though not within the city, where fire engines are firmly held to a top speed of 35. On a level stretch, it shot from a cold start to 50 m.p.h. in 45 seconds.

But to the Fire Department, more important than sprinting ability are power to pump; power to climb; fast, sure starts; low maintenance costs; brief down time for overhaul. In these respects, the top brass have already been dazzled by the performance of the little Boeing 502 Turbo Chief.

An engineer's dream. The engine is only 41.5 inches long and two feet in diameter. It weighs but 325 pounds. Yet at full throttle it produces 330 hp., ful-



RADIATOR-TYPE OIL COOLER is mounted at bottom of the engine compartment. When compartment's sides are in place, air can't get in except through the cooler. It is drawn in by suction created above when exhaust from 10-inch pipe enters 14-inch duct leading to the stack on top.

filling the engineer's dream of obtaining one horsepower per pound of weight.

It is only one-tenth as heavy and takes up only one-quarter as much space as a conventional pumper engine. In its standard-size compartment, it looks rather like a small foot in a big shoe.

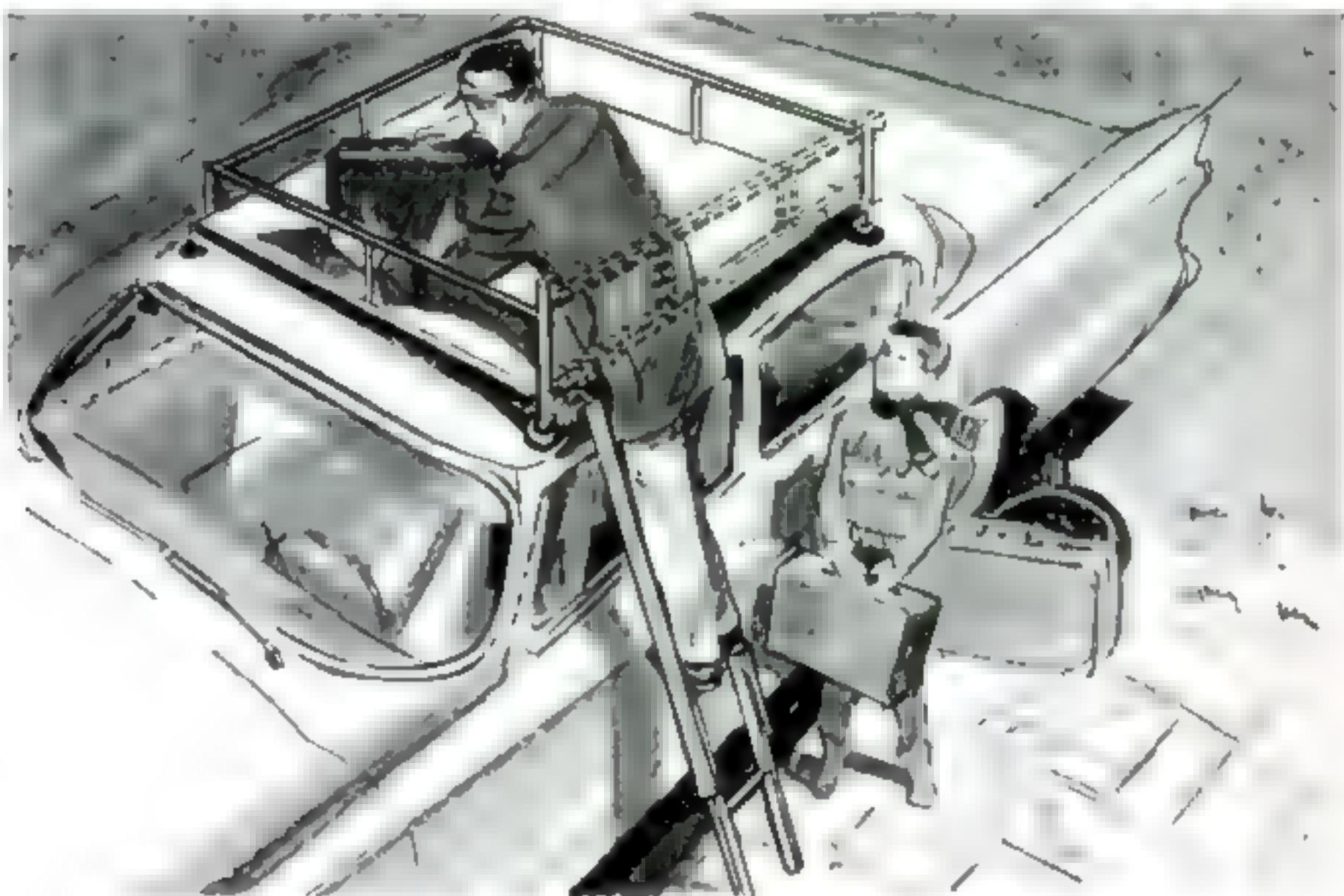
Its use so lightened the front end of the pumper that the fire truck's builder was able to achieve an ideal weight distribution of one-third up front, two-thirds in the rear.

This is a boon to the man at the wheel. "She handles as if she had power steering," said one of the drivers.

After far outpumping all Department rivals with piston engines, the Turbo Chief charged up one of San Francisco's steepest streets—a 20.2-percent grade—

[Continued on page 186]

New Ideas from the Inventors



Roof Rack Helps You Load. Parallel hinged rails on one side of this recently patented car-top carrier would open out and down, then extend to ground level to

form a ladder. By improving access to the carrier platform, the ladder-side combination would make loading or unloading easier on you and your luggage.

Tray Keeps Toast Warm. Heat rising through holes in this stamped-metal tray would keep your first slice of toast as warm as the last. Saddle-like flanges would fit over a pop-up toaster. To reach the toaster (or serve the toast) you'd lift the tray by its insulated handles.

Cigarette Box Holds Ashes. You'd never have to hunt for an ashtray if your cigarettes came in a box like this. Lifting the box lid would allow the hinged, V-notched, fireproof cardboard front to open out, forming both an ash receptacle and a cigarette rest.



More Inventors' Ideas



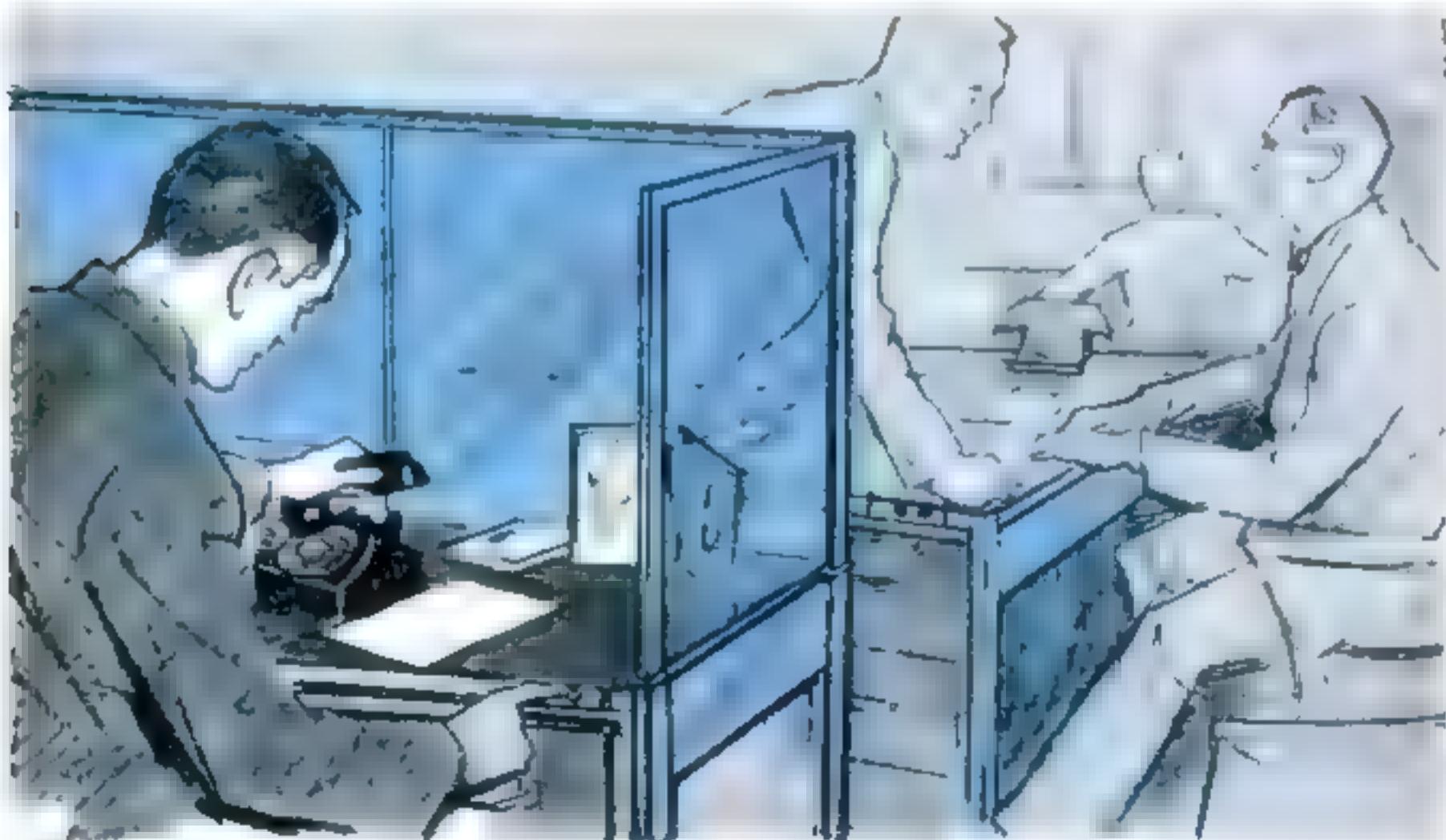
Suction Speeds Electric Shave. Fan-like vanes would set up an air flow in the cylindrical housing of this shaver. The suction, it is claimed, would help draw the hairs into the rotary cutters, giving you a faster, closer shave. Suction would also help clean the razor.

Desk Panels Rise for Privacy. Motor-driven panels on three sides of this open-office desk would be raised at the push of a button. The glass partitions could be



Scraper Keeps Car Clean. Recessed into any automobile door, this fold-down foot scraper would close flush with the door upholstery. A spring latch would drop the brush platform into shoe-cleaning position so that passengers would not track mud and dirt into the car.

elevated, when needed, to cut distracting outside noises, or to provide greater privacy for both telephone conversations and talks with visitors or customers.





Walking Boot Extends for Wading. A hunter could quickly convert these walking boots into waterproof, thigh-length waders. An extension flap, normally folded inside, would join the inner and outer sections. Loosening the laces would allow the wader section to be pulled up.

Paint Roller Feeds Roller. Two rollers and a reservoir in this applicator would let you paint any flat surface quickly and easily. One roller would pick up paint from the tray. A thumb lever would let you lower the other roller into contact with the pickup, then raise it to apply a uniform paint coat with a smooth and nearly continuous motion.



Platform Cushions Slide Pole. A raised, springy platform at the base of a firehouse pole would cushion fast descents and help speed a crew on its way. Resilient knobs under this foam-rubber platform would bounce a man safely up and off, thus clearing the way more quickly for the next man down.

The following patents have been issued on these inventions:
 Carrier—No. 2,819,005 to J. Roberts, Portland, Ore.; Trash tray—No. 2,828,645 to E. Ogie, Bozeman, Mont.; Ash tray—No. 2,944,555 to C. and D. Peel, Spring Lake, Mich.; Shaver—No. 2,821,367 to A. McWilliams, Chicago; Foot scraper—No. 2,818,594 to D. Dawkins, Alexandria, Va.; Desk—No. 2,944,861 to M. Lessin, Washington, D. C.; Boot—No. 2,824,390 to F. Walker, Framingham, Mass.; Roller—No. 2,824,325 to H. Lassner, Fitchburg, Mass.; Slider cushion—No. 2,945,550 to N. Andreessen, Chicago.

Copies of patents may be ordered, by number, from the Commissioner of Patents, Washington 25, D. C., at 25 cents each. To write to an inventor, if the address given above is insufficient, you may address him (by name and patent number) in care of the Commissioner of Patents.

Atomic power comes to the Arctic

Electricity is now being provided by a modern 1,500-kw. nuclear power plant at Camp Century, the U. S. Army's city under ice [PS, Feb. '60] in Greenland. The plant was prefabricated in 28 sections by Alco Products, Inc., at Dunkirk, N. Y., and the first section flown to the ice cap. The remainder traveled on the Marine Fiddler of the Military Sea Transport Service from Buffalo through the St. Lawrence Seaway to Thule, and from there was hauled by sled train.

The site on which sections were reassembled consists of four long trenches buried under tons of snow. One contains the reactor, vapor condenser, and uranium core; one an air-blast cooler; a third the feed water and controls; and the last the turbine generator. After reassembly last fall, the plant was put through a series of low-power test runs prior to going into full operation.



PULLED BY TRACTOR, vapor condenser for nuclear power plant reaches Camp Century on sledge.



ANGLED CONSOLES are equipped with keyboards to enable trained operators to sort with fingers instead of hands.



TIERED BOXES behind panel can be unloaded without bend or stretch.

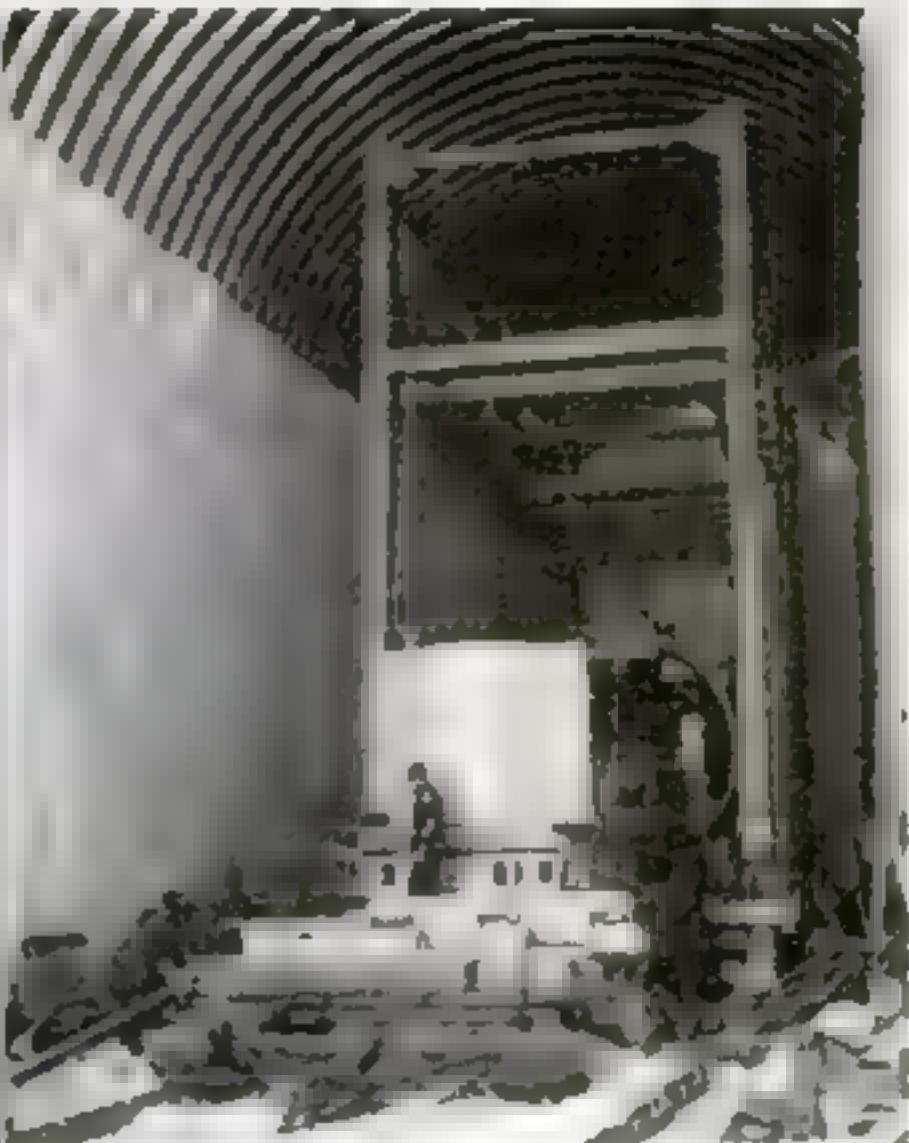
New letter sorter speeds the mail

Handled by 12 operators at keyboard consoles, 60,000 letters can be sorted to 300 destination boxes in an hour. Speed is controlled through an electronic nerve center, and the flow of letters can be started, changed, or stopped at a super-

visor's monitoring panel at one end. The new machine is designed in multiple units to suit the needs of different-size post offices. The first was installed by Pitney-Bowes in a mechanization program at the post office in Washington.



CONDENSER IS MOVED into reactor trench. Man walking beam at top is at original snow level.



PART OF REACTOR is assembled in trench that will also hold condenser and U-235 fuel core.



Underwater camera

When the propellers of the aircraft carrier Independence were damaged recently, underwater photos were needed before repairs could be made. Since an underwater camera wasn't available, Electronics Technician Edward J. Lamb made his own—out of a conventional 35-mm. camera and a gutted underwater battle lantern. Two valves and a length of wire release the shutter.



Drill cuts four-inch hole

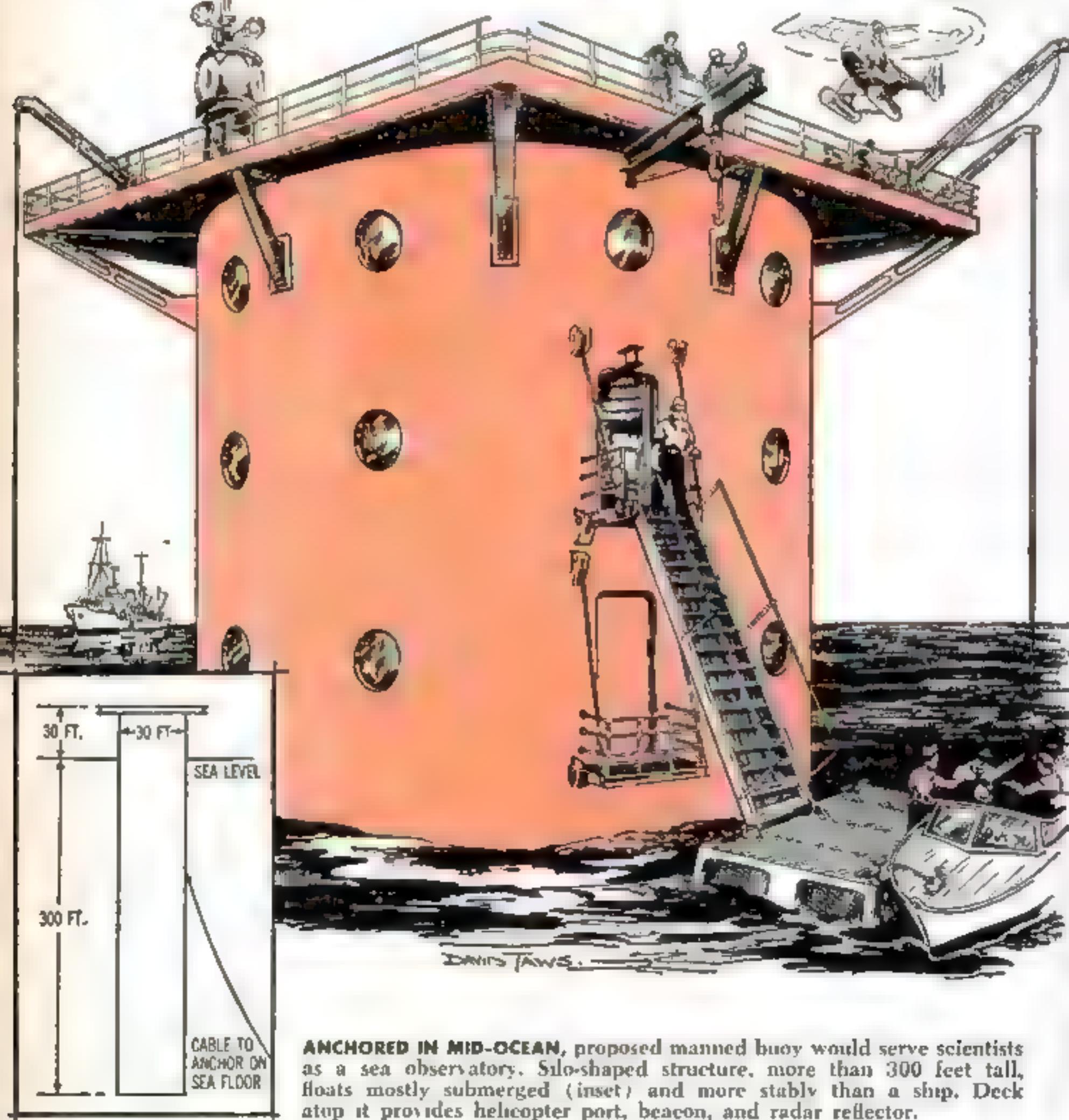
This new electric impact drill is no larger than a $\frac{1}{4}$ -inch tool, but it bores holes from $\frac{1}{8}$ to four inches in diameter in a single operation. It cuts through brick, tile, reinforced concrete, and granite, chewing embedded metal with no hesitation. It's shown here drilling for output cables in the wall of a power station being erected at Bridgeport, Conn., for the Stanley Works, maker of the tool.

Manned Buoy to Probe Ocean Depths

By Alden P. Armagnac

A STRANGE towering structure, a great vertical cylinder capped by an overhanging platform, bobs at anchor in mid-ocean. Above water, it rises 30 feet. Below the surface, it reaches at least 300 feet down. Aboard this all-but-submerged artificial island, as many as 25 scientists and crewmen live and work.

That's a preview of a giant "manned buoy" that the U. S.



ANCHORED IN MID-OCEAN, proposed manned buoy would serve scientists as a sea observatory. Silo-shaped structure, more than 300 feet tall, floats mostly submerged (inset) and more stably than a ship. Deck atop it provides helicopter port, beacon, and radar reflector.

Inside view shows how observers live and work aboard buoy

OBSERVATION DECK
AND HELICOPTER POINT

RADIO CENTER
AND METEOROLOGICAL STATION

GENERATING PLANT
to provide light
and power for buoy

STORAGE FOR FOODS
and stores

SEA LEVEL

LIVING QUARTERS
for 10 to 15 observers
and crew of 5 to 10

LABORATORIES
for analyzing biological
specimens, drafting and
copying maps of sea areas,
and other research

OBSERVATION GALLERY
for viewing ocean life

MACHINE SHOP
AND PHOTO LAB

STORAGE
for provisions and
laboratory supplies

BALLAST
and buoyancy tanks
Kept in up-and-down
after it has been towed
horizontally to site

BEACON
LIGHT

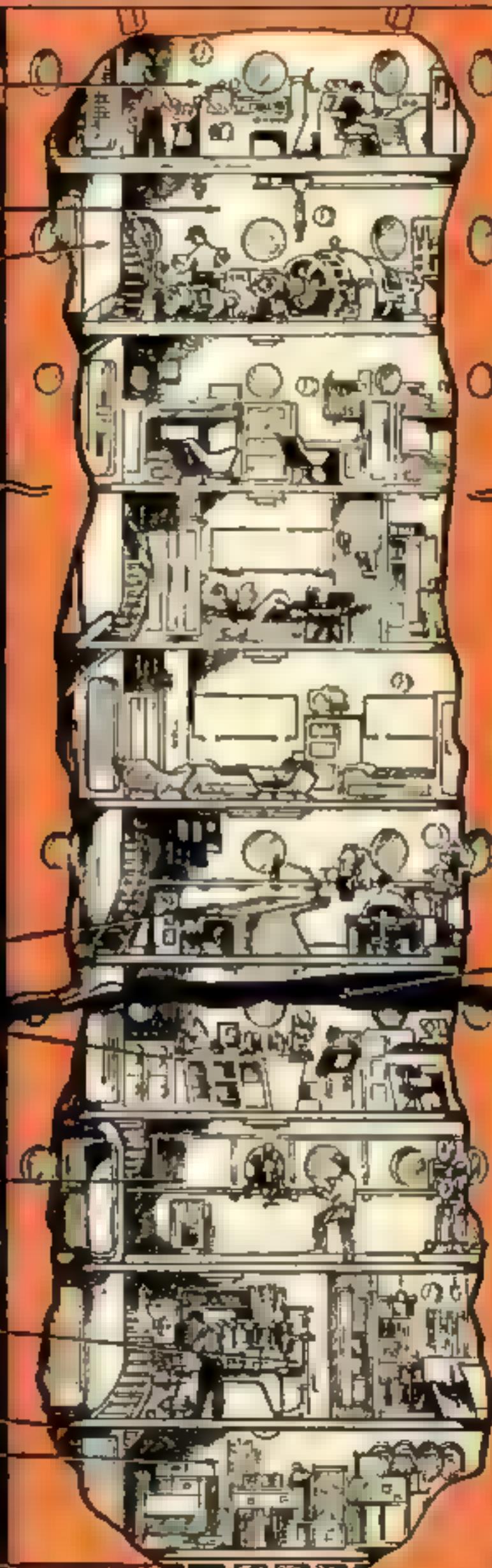
GEAR FOR
LOWERING
INSTRUMENTS
INTO SEA

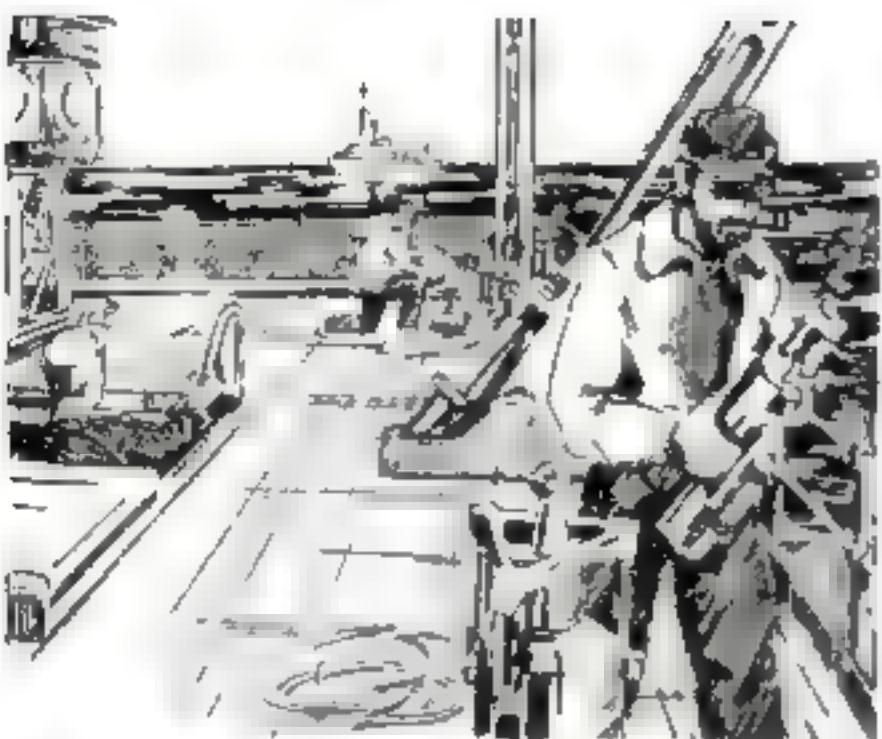
LANDING
STAGE

MORE LABS,
OBSERVATION
GALLERIES,
SHOPS, AND
STOREROOMS
IN SECTION
NOT SHOWN

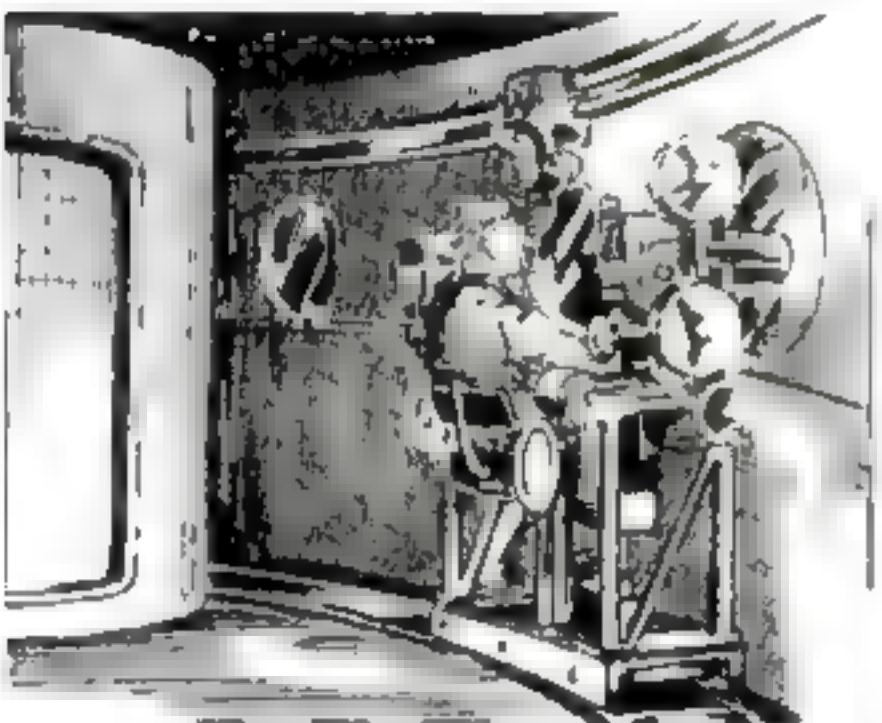
UNDERSEA
LAMPS ON
EXTERIOR
OF BUOY

DAVID TAYLOR





OBSERVERS on buoy's top deck lower instruments into sea to take its temperature, and to collect samples of water, which will be analyzed for salinity by chemical lab in buoy's interior.



SUBMARINE OBSERVATION GALLERY gives view, through portholes, of sea creatures illuminated by lamps outside. Camera truck could roll on circular track from one window to another.



UNDERWATER AQUARIUM could aid study of sea life hundreds of feet down, under natural water pressure there. Tank within buoy confines fish but has a water passage open to the sea.

is urged to design and build for use as an observatory to study the sea. Proposed by the National Academy of Sciences, it would be a prototype for an eventual network of many similar deep-sea observing stations—which NAS' Committee on Oceanography sees as a "standard requirement" for marine research and weather forecasting in the near future.

Drawings on these pages show what the projected \$2,500,000 buoy might look like, according to suggestions by one of the experts of the NAS committee's engineering panel—Dr. Robert Frosch, director of Columbia University's Hudson Laboratories at Dobbs Ferry, N. Y.

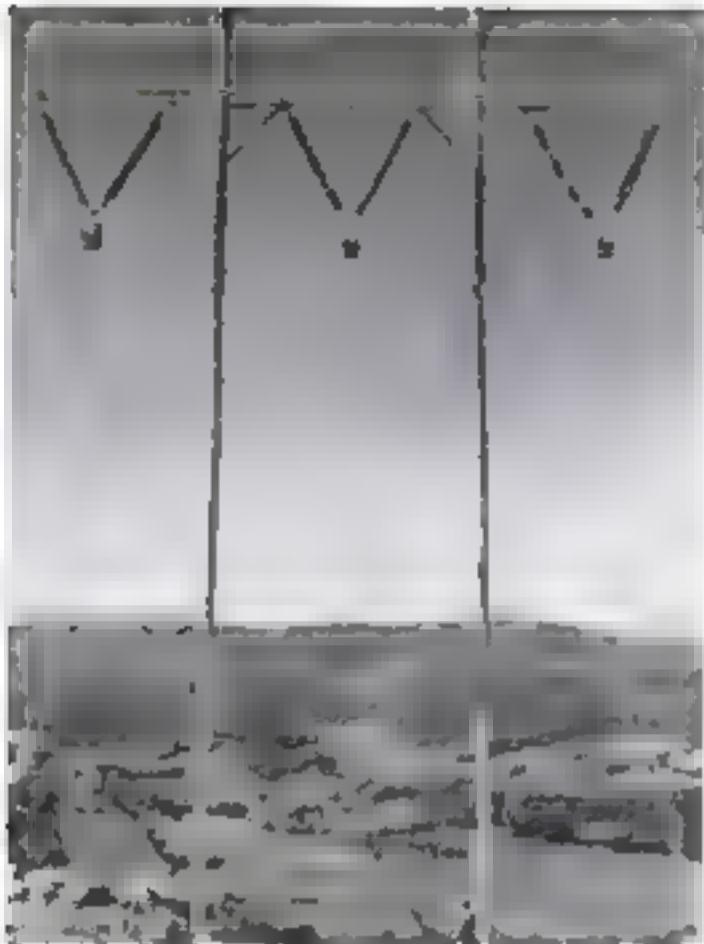
Painted most likely a bright "international" orange for high visibility, the buoy will mount a beacon light and a radar reflector as aids to navigation. Personnel will come and go, and supplies will arrive, on a buoy-tending vessel, resembling an ocean-going tug. To transfer people and cargo, the buoy provides a landing stage, cranes, and hose connections for liquid fuel. Its flat top, an open-air observation deck, also offers a landing place for helicopters.

Inside the silo-shaped buoy, an electric elevator gives access to living quarters, labs, and shops, arranged as pictured on its 25 or 30 levels.

Installed above sea level, lest it hinder delicate underwater-sound measurements, a diesel-electric or gas turbine-electric power plant generates 1,000 to 2,000 kilowatts of electricity for lighting and other uses.

Weather observers will operate a complete meteorological station—equipped to launch balloons and, possibly, upper-atmosphere sounding rockets. Sea scientists will measure and photograph waves, take the sea's temperature, analyze samples of its water, study underwater sound with sound generators and listening hydrophones. They'll lower submarine cameras, TV apparatus, and nets for collecting undersea life. Conducted continuously at a permanent site, these observations should prove far more revealing and valuable than the fragmentary data obtainable by cruising ships.

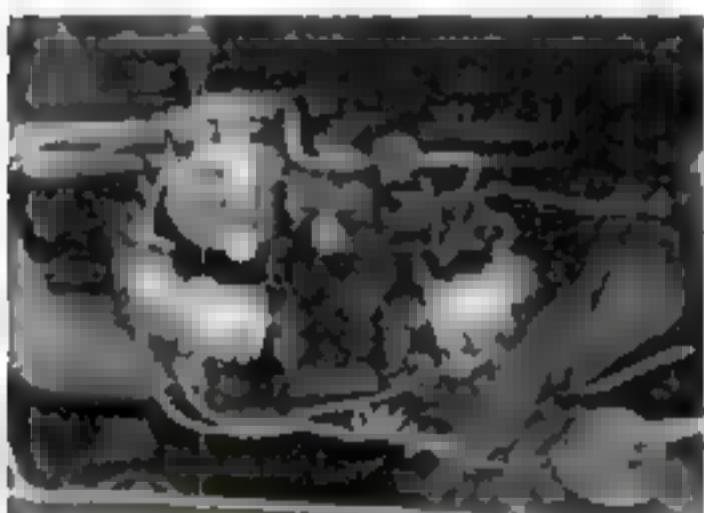
For the first manned buoy, the NAS suggests a choice of three locations: in the Sargasso Sea, off San Diego, or east of the Antilles where hurricanes begin.



460,000-volt line

Extra-high-voltage electricity now flows from ridge to ridge in the Allegheny Mountains. It's a 460-kv. power-transmission line recently put into network operation by the Pennsylvania Electric Co. over 13 miles from Claysburg to Saxton, Pa.

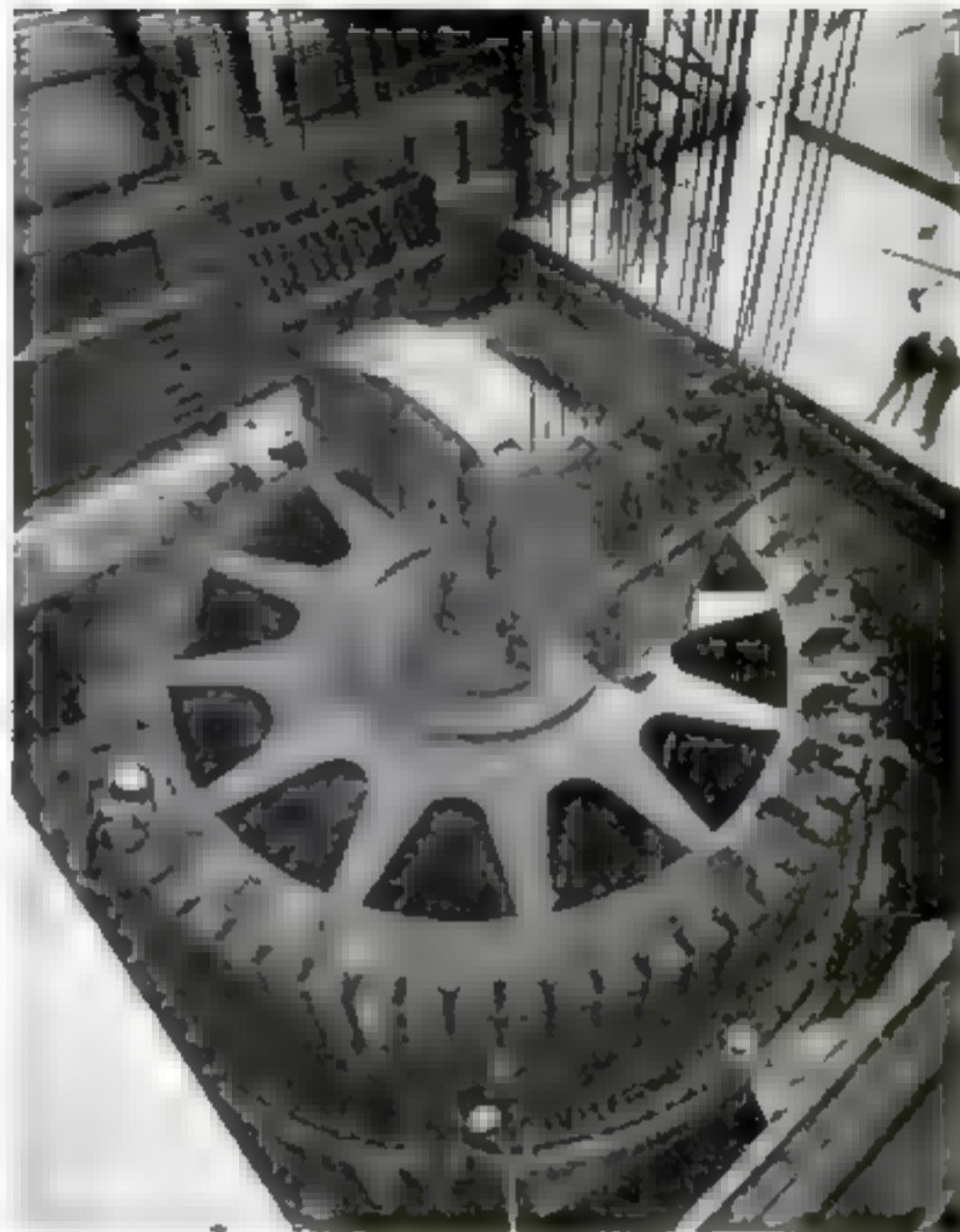
To conduct this ultra voltage, steel-reinforced aluminum cables 2.32 inches in diameter—as thick as a man's wrist—are strung on 15-foot insulators between towers from 60 to 137 feet tall.



Starting a car quickly

Heating elements clamped around the carburetor bowl and inlet manifold assist gas vaporizing and cold starting, minimize use of choke and dilution of oil, and prevent carburetor icing.

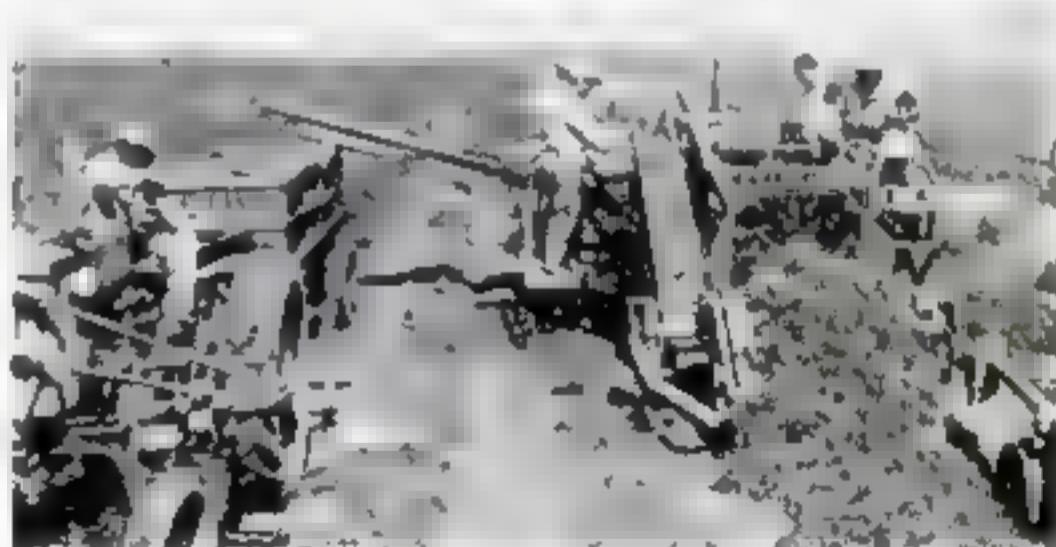
Switched on 90 seconds before a start, the three 12-volt, 50-watt elements in this British device reduce battery drain by eliminating prolonged cranking.



Giant water wheel

A 500-ton rotor—the first of 13—here is being nestled into its stator by a huge crane at a power plant being built at Niagara Falls. The 35-foot-diameter wheel will rotate in its 150,000-kw. generator at a speed of 120 r.p.m.

First power is scheduled to be delivered this month. When completed, the big plant will be able to generate a total of 1,950,000 kw.



Mechanical tomato picker

This machine can harvest as many ripe tomatoes as 60 men. Tomatoes are picked off the plants by fingers on the straddling device at right as it moves through a field and deposited by conveyor belt into bins pulled by a tractor. The rig was built at the University of California.

WHAT'S NEW



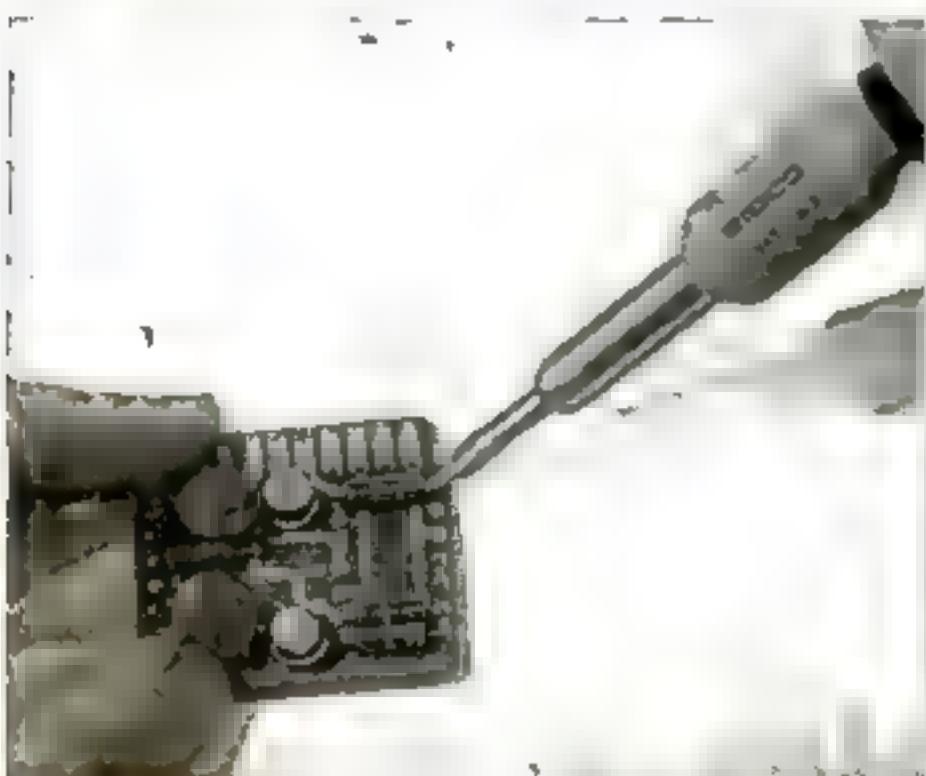
DISHWASHER operates by pushbutton on three cycles. One rinses and then holds breakfast dishes for a fuller load, another handles the full load, a third gives pots and pans extra soaking, less drying. \$360. KitchenAid, Troy, Ohio.

DESOLDERING TIPLER fits into an air-cooled iron (PS, Sept. '60) for unsoldering connections, especially on printed circuits, or straightening bent or folded slugs. A slot grips the wire so you can pull it away when the solder melts. Tipter is interchangeable with other tips in a heating element. Handle, \$2.50; heating element, \$2; tiptet, 50 cents. SIDCO, Venice, Calif.



AIR CONDITIONER is turned on, off, high, low, or medium by remote control. An amplifier in the unit works, like some TV sets, on signal from wireless transmitter across room. \$499.95. Admiral Corp., 3800 Cortland St., Chicago.

PACKAGE OF POWER contains a battery charger, inverter, and space for a 12-volt battery in a single case. It's called an Activertor and provides 110-volt AC in camps, trailers, and boats for operating your power tools, electrical appliances, lights, TV set, and radio. Without the battery, it's priced at \$149.95. Electric Storage Battery Co., 1717 E. Ninth St., Cleveland.





Dog Sled for Back-Yard Mushers

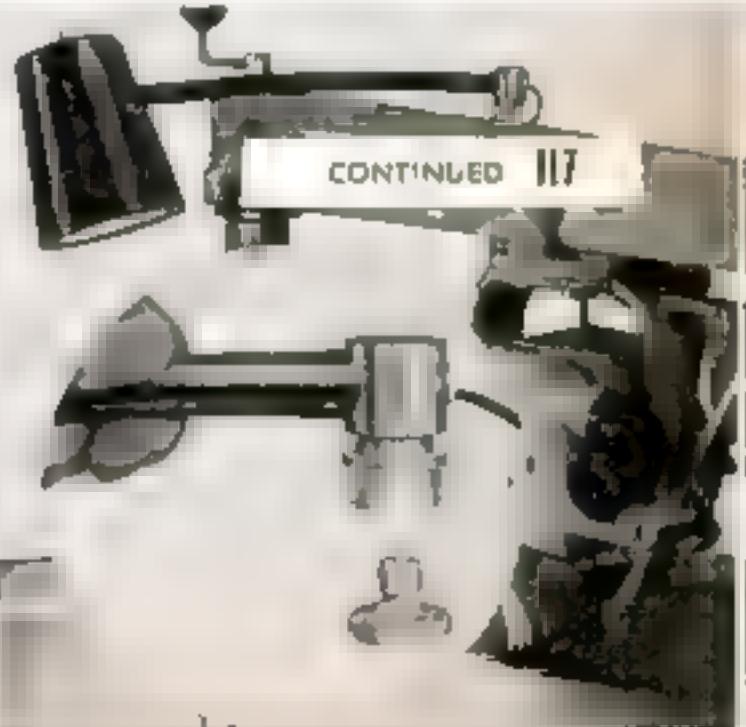
This Yukon-type sled is built of Maine ash to stand abuse. It comes with harness and tug rope, ready to be pulled over snow by your dog, assuming that he's

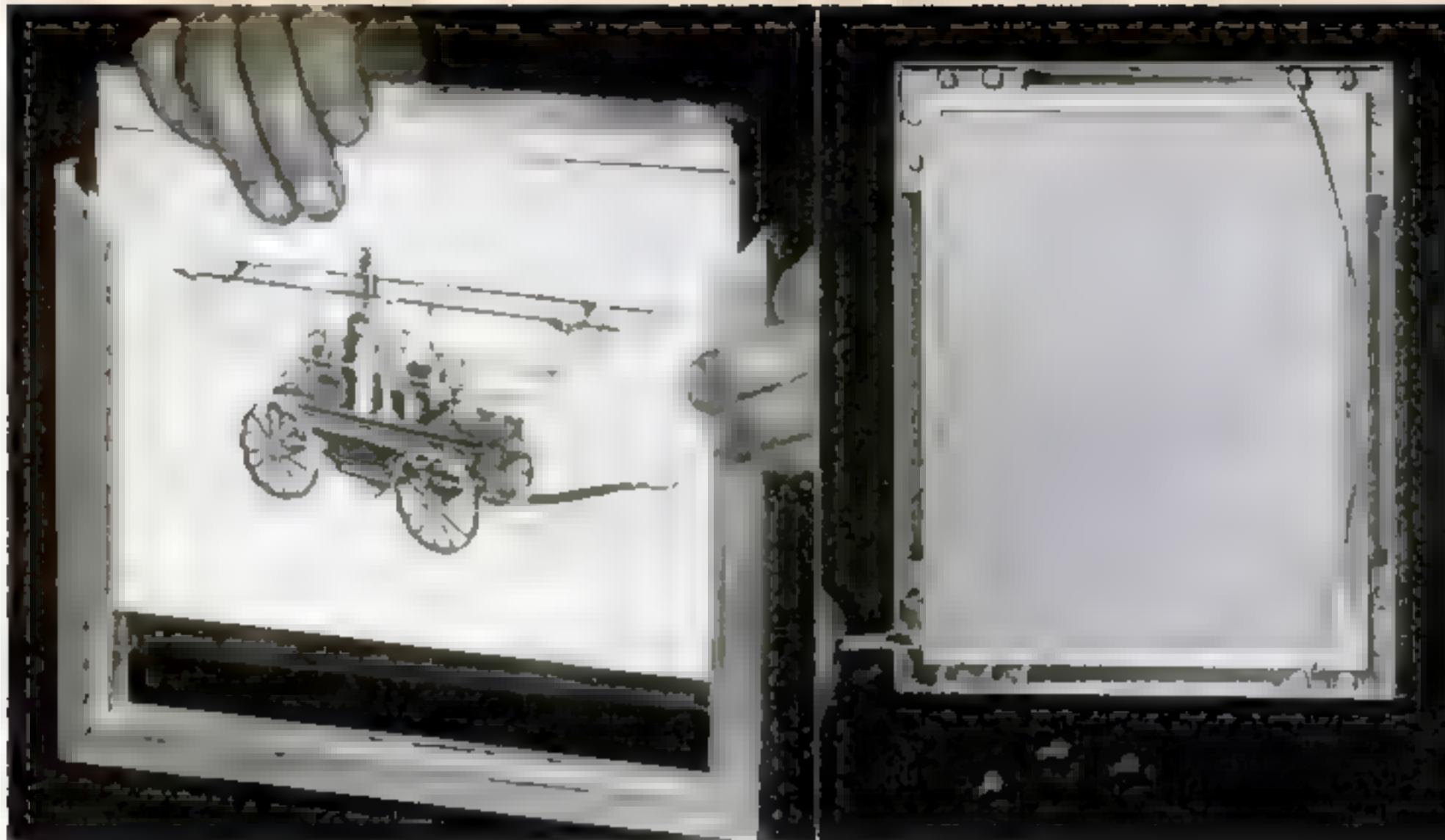
willing. It's 53 inches long and 18½ wide, seats two children on a vinyl-covered pad, with a third standing to drive. It costs \$30. Withington, West Minot, Maine.

EPOXY GLUE is now put up in a divided package with a clip separating measured resin and catalyst. You pull the pin, knead, snip a corner, and apply. Glue comes in clear, white, steel, and aluminum at 79 cents a pack. LePage's, Paper Square, Pittsburgh.

SHINGLE HATCHET has adjustable pin that regulates depth of cut. You insert the pin in half-inch spaced holes corresponding to cut desired. The tool is steel forged in one piece, has a nylon-vinyl cushion grip. \$7.25. Estwing Mfg. Co., Rockford, Ill.

SHOP LAMP mounts on snap-on brackets for individual tools, wall, ceiling, bench, or under your car's hood to give you light where you want it from a single lamp. Plastic or neoprene, \$8.95 to \$12.95. Moffatt Products, Inc., 3124 Washington Ave. N., Minneapolis.





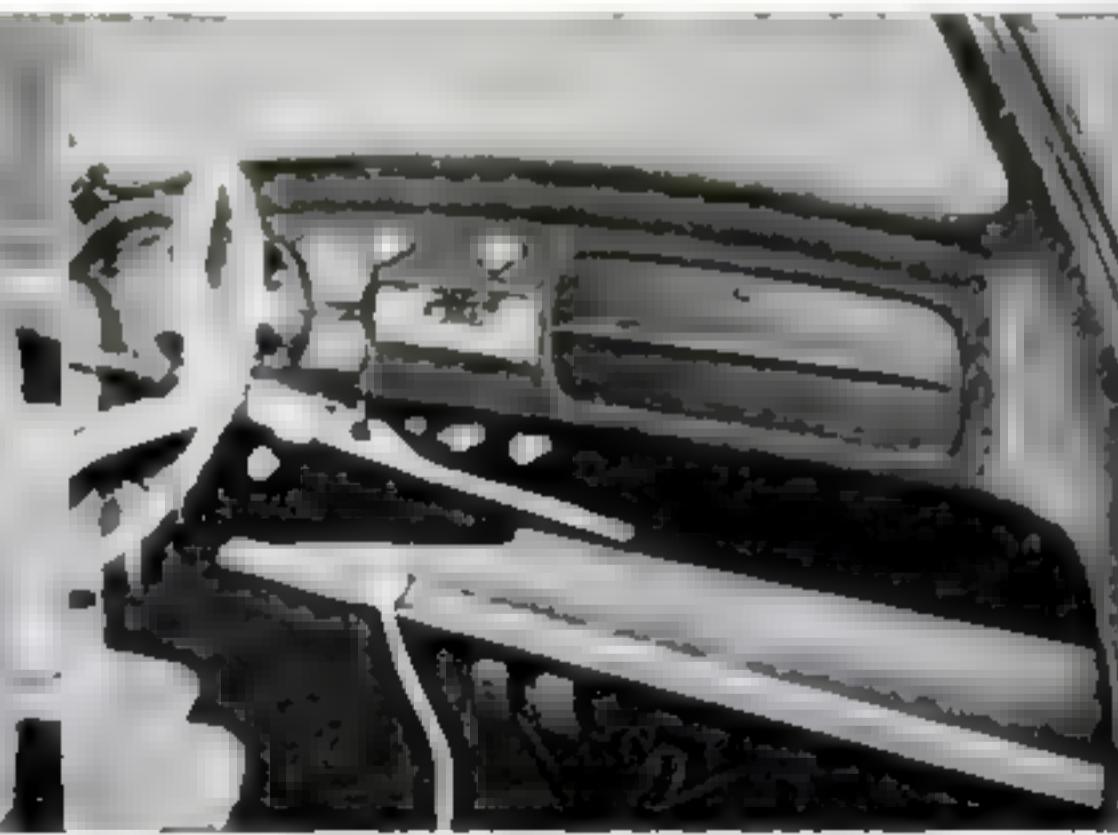
Do-It-Yourself Aluminum Frame

Ornamental channeled aluminum now comes in kits for making picture frames. Each package contains a six-foot length you can cut into an 18-by-18 or 12-by-24-inch frame, plus corner braces, bolts,

nuts, and a project sheet. You miter the ends, slip nuts under a lip in a channel, place the braces on top of the lip, and assemble with a screwdriver. Price, \$3 a kit. Reynolds Metals Co., Richmond, Va.



PARKING MINDER is a key-chain timer that sounds an alarm to remind you that your time at a parking meter has expired. You set it by turning an indicator to any time up to 60 minutes. When the pointer reaches zero, a buzzer sounds off. It costs \$3.95. ORCOA, 59 Hempstead Garden Dr., W. Hempstead, N.Y.



UNDER-DASH SHELF is a sheet of vinyl-finished hardboard that wedges between the kick pads at the doors of a Volkswagen (except convertibles) to give you three square feet of extra storage space. To remove for cleaning, just pull it toward you. \$8.95. Powers Mfg. Co., 3632 Montgalt, Kansas City, Mo.

BELT HOLSTER has one pocket for a flashlight and another for a continuity tester, leaves both hands free for you to work on other electrical jobs. Carrying case alone lists at \$1.50; with flashlight and tester, \$7.30. Bright Star Industries, Clifton, N. J.



ARM STRETCHER gives you extra reach for carrying large panels of plywood, hardboard, and glass; or window frames, bed springs, and mattresses. It puts the weight where you can manage it without strain. The handle is adjustable to three positions. Rubber grips on the lower end prevent slipping, or marring of edges. \$5.95. Long Arm, Box 351, Elm Grove, Wis.



TRUCK TARPAULIN fits over a scissor-action frame to protect cargo in half- to one-ton pickup or stake trucks. It rides on runners, can be collapsed against the cab by one man to make unloading easier. It sells for \$198.95. Griffin Research & Design, Ltd., 2018 Seventh Ave., N.W., Calgary, Can.

ROTARY SHAVER is made by the manufacturer of a well-known line of portable electric tools. Small and easy to handle, it runs on a commutator-and-brush motor having extra-long brushes that do not need adjustment. Cutter is permanently mounted. \$19.95. Wen Products, 5810 Northwest Hwy., Chicago.

How a Limited-Slip

UNTIL early horseless-carriage makers remembered an even older invention, they either drove only one wheel or skidded around every turn.

In 1827 a Frenchman named Pecquer had devised a gearbox that drove two separate wheel axles equally, yet allowed one to turn faster than the other on curves. We still use it. But if one wheel spins on mud or ice, the differential turns only that one, letting the other stand.

A limited-slip differential uses, besides Pecquer's box of tricks, automatic clutches that reverse its bad habits. If a

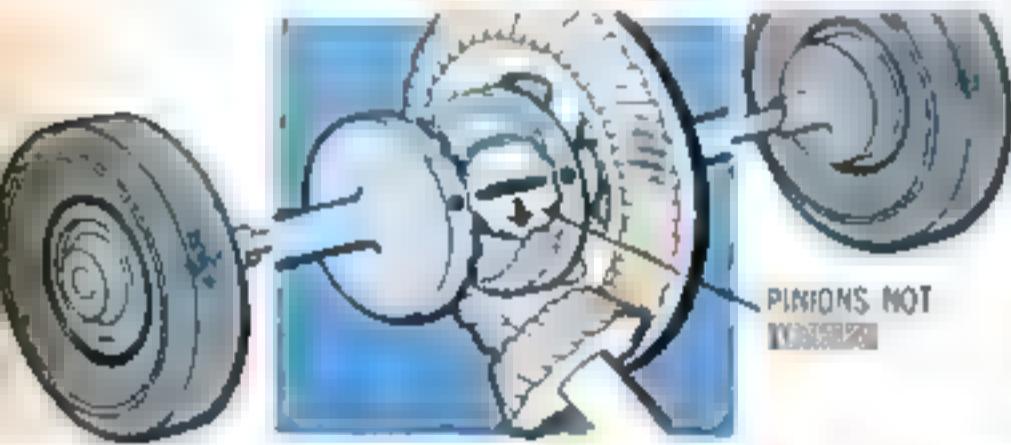
wheel slips, its clutch resists its spin and proportionately more (instead of less) torque is shifted to the other wheel.

Even with both wheels on ice, such a differential favors the one with slightly more grip. If neither holds, the driver puts a tire chain on only one wheel; the differential will route torque in its favor. Or, if the hand brake works directly on the rear wheels, he can apply it part way. This synthetic load tricks the differential into sending the wheel with better traction up to five times as much torque as the other.

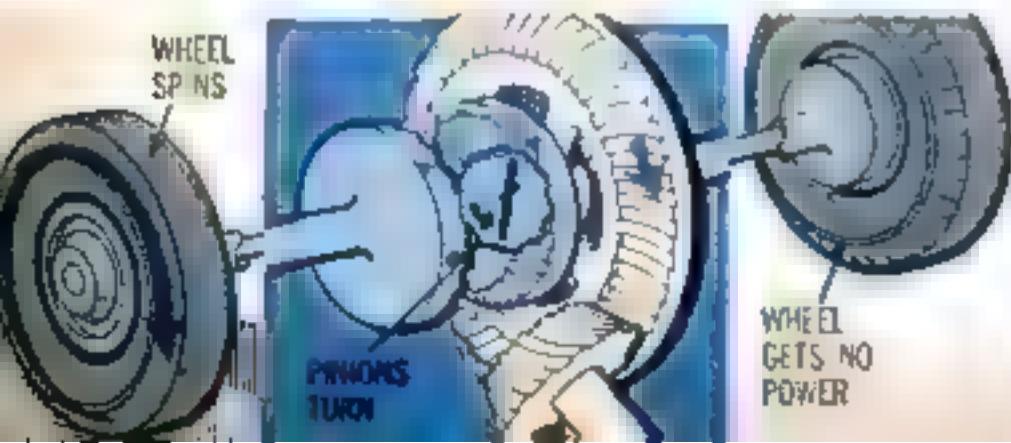
What a differential does



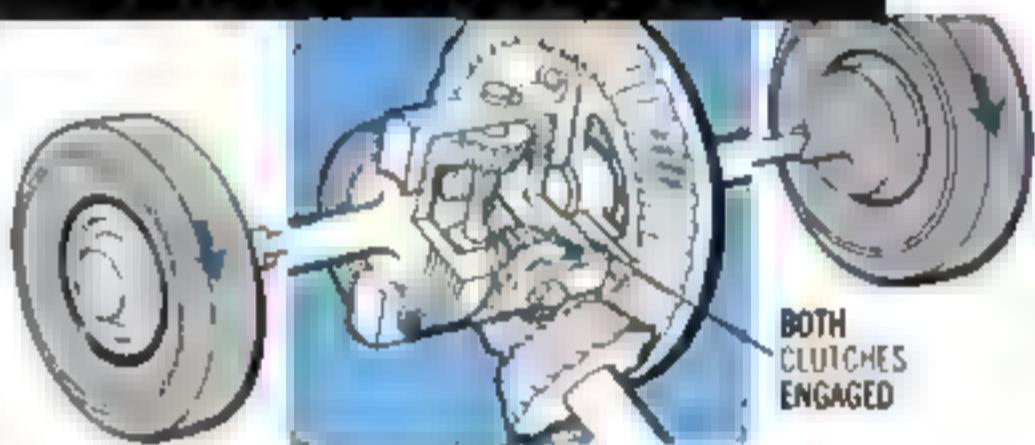
DRIVE-SHAFT PINION turns the big ring gear, on which is mounted the differential cage (here shown diagrammatically as two brackets). The cage carries around a cross shaft with two small pinions free to turn on it. These constantly mesh with two side gears, one on each of the two entirely separate wheel axles.



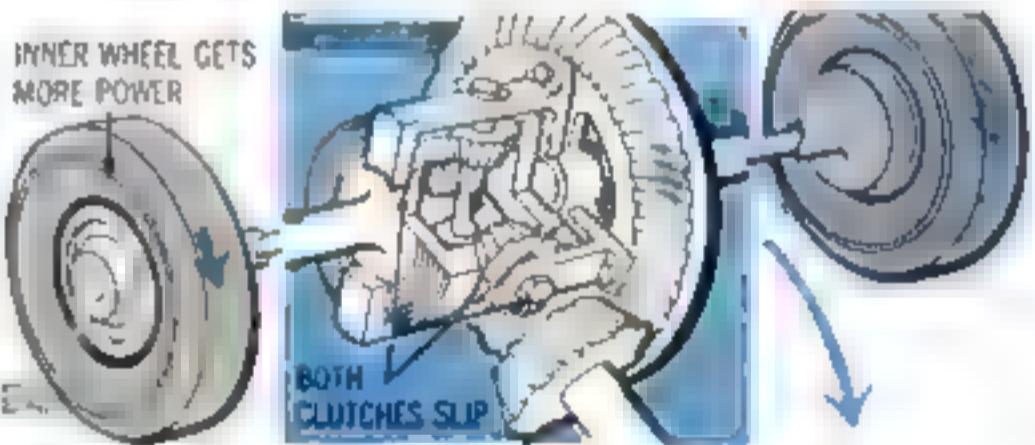
ON STRAIGHT ROADS, the pinions act like bars connecting the side gears (above) and pull them around at equal speed. But on a curve or with a wheel on ice (below), the greater resistance of the gear on the road-loaded side makes pinions roll around it. Rotating, they turn the free-side gear proportionately faster.



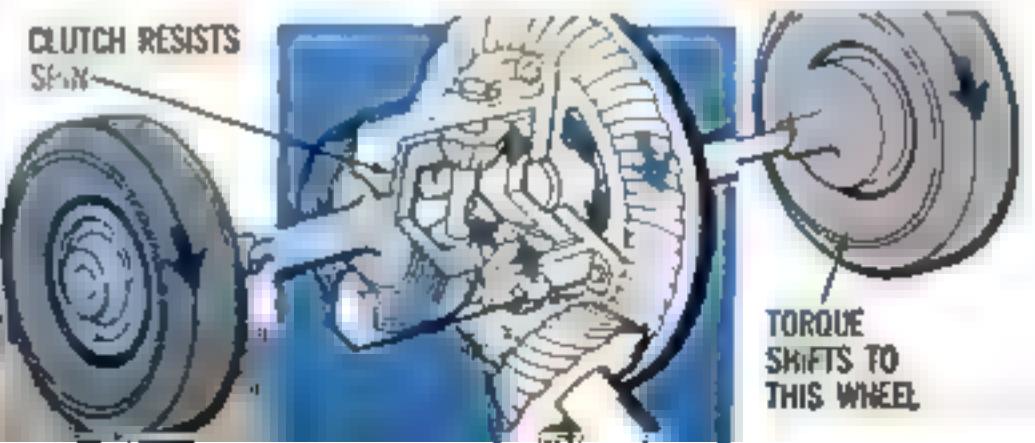
Clutches shift the power



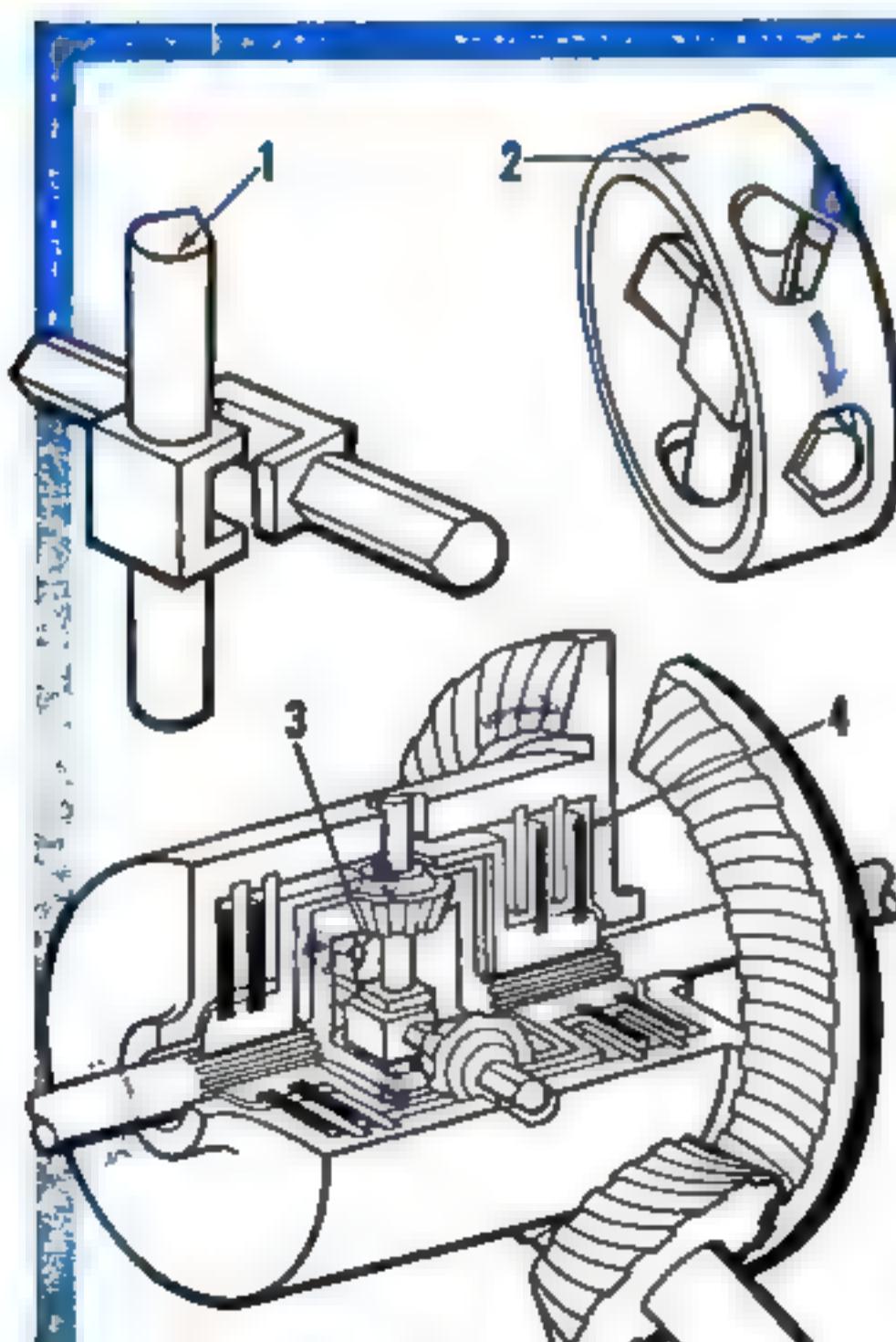
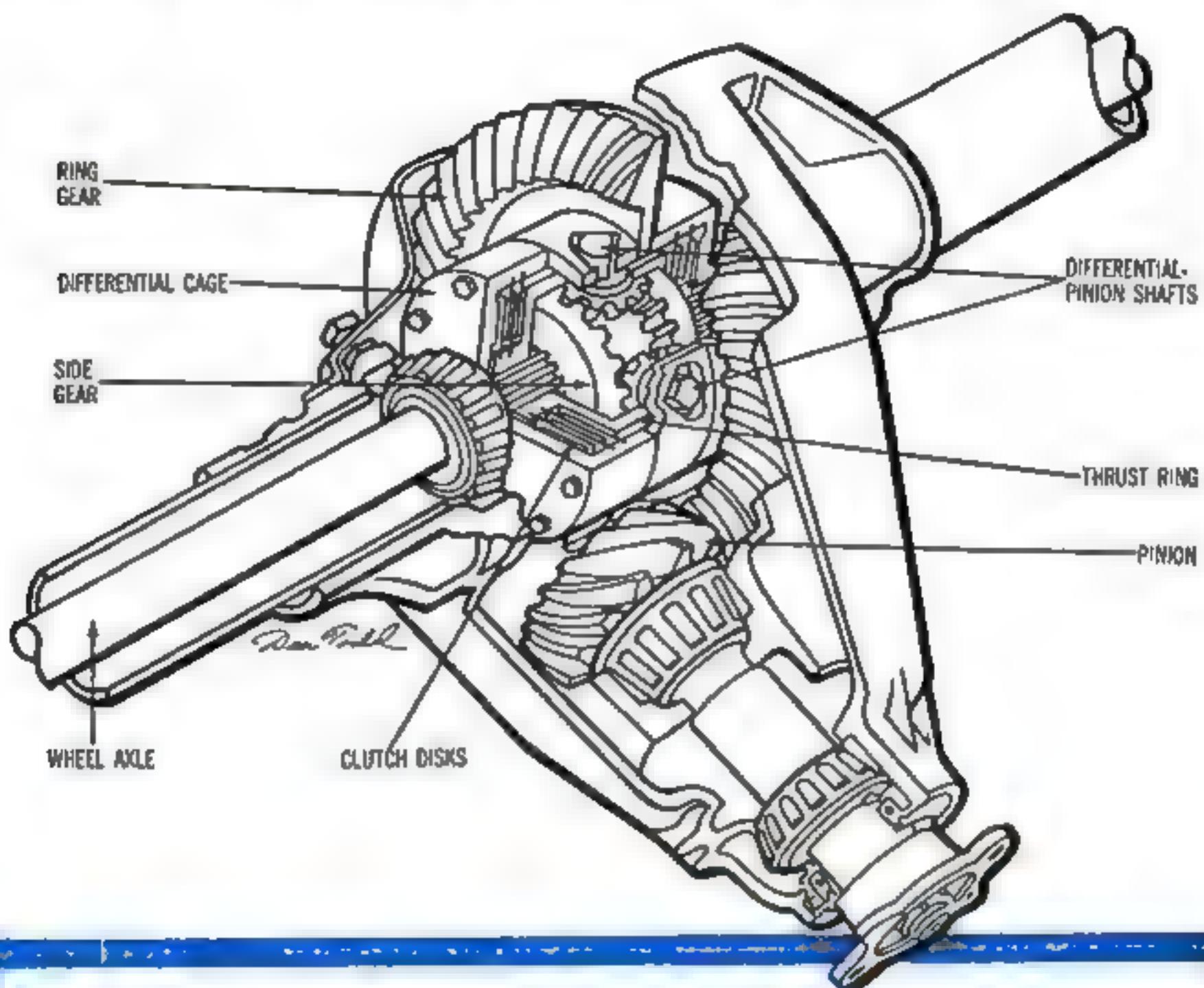
LIMITED-SLIP DIFFERENTIAL has the same gear setup but with four differential pinions, plus a clutch on each side. One set of clutch disks is keyed to the differential cage; the other disks are splined to the wheel axles. In straight going, both clutches are engaged, preventing wheel-slip on bumpy roads.



IN TAKING A CURVE, the outer wheel over-speeds the cage. This slackens pressure on both clutches, letting them slip so that the wheels turn independently. But if one wheel spins on ice (below) the clutches act like a one-wheel brake, counteracting the differential's action and transferring power to the other wheel.



Differential Works



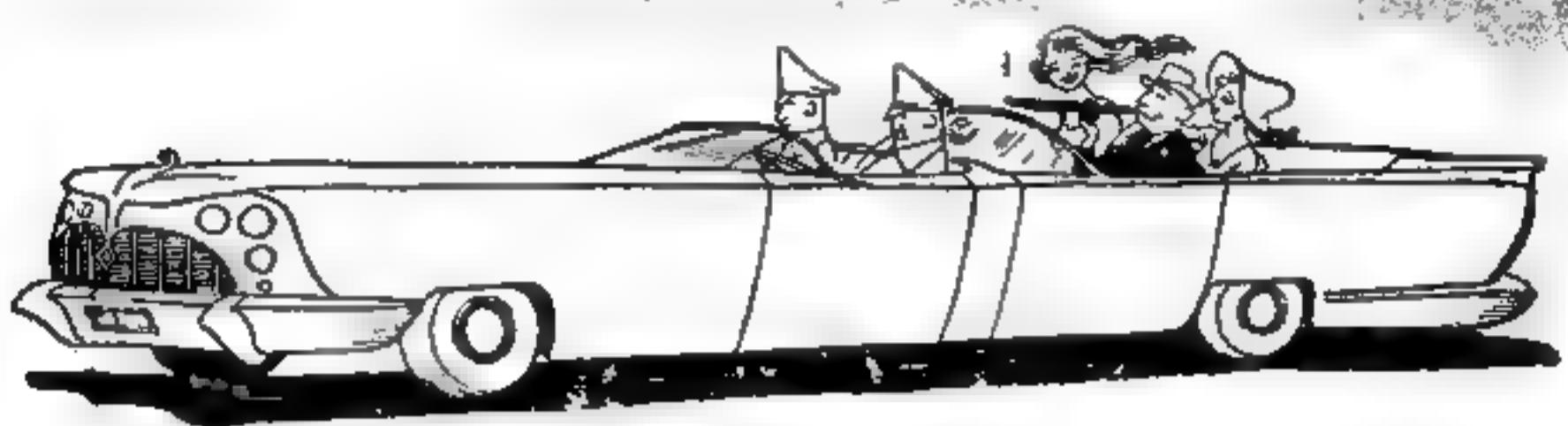
Floating pinions sense road load to control clutch action

1 TWO CROSS SHAFTS that carry the differential pinions are loosely joined at the center. Outer ends of shafts are V shaped, with V points of one opposite those of the other.

2 HOLES IN DIFFERENTIAL CAGE have internal Vs or cam surfaces matching those on shafts. As cage turns, wheel resistance makes cross shafts lag. Drive torque forces V ends up cams, pushing shafts and pinions outward.

3 MOVING OUT, pinion shoulders bear on a thrust ring that squeezes the clutch disks together (arrows, left). Effect of clutches is to drive wheels directly from the cage, whether car is accelerating or decelerating.

4 OVERRUNNING OUTER WHEEL on a turn makes pinions rotate and try to overspeed the cage. This torque reversal backs shaft ends off cam ramps, easing clutch pressure. Clutches slip and differential acts normally. But if a wheel spins on ice, torque driving it engages both clutches, creating drag between wheels and cage. This resists spin of slipping wheel, transfers torque needed to spin it (and that to slip the clutches) to wheel with traction. Differential above is made by Dana Corp.



STRAIGHT TALK TO INVENTORS: 1

So You've Invented Something . . . Now What?



It is still possible to make a million with a fresh idea. But with 50,000 patents being ground out every year, not many inventors ever hit real pay dirt.

With this article, POPULAR SCIENCE begins a new series that will interest

every man who ever dreamed up something new and useful, and who wants to protect his valuable idea and turn it into cash in the bank.

This month, read how to go about marketing your invention. Next month: "What Should I Invent?"

By Martin Mann

THE Great American Dream is to invent something that will make a million dollars. Lots of people realize the invention part of that dream. Every week the U. S. Patent Office issues 1,000 magnificently engraved certificates attesting to it. Some of them make money. A few hit the jackpot.

George Nelson, for example. In 1940 he was a mechanic bolting down deck plates in a San Francisco shipyard. Too slow for wartime. So he invented a flux-filled stud, and a semiautomatic gun for welding the stud to the ship's frame. Together they eliminated a finicky drilling and tapping operation.

The next year Nelson got three patents. By 1942 he was the Nelson Stud-Welding Corp. He hit up his friends for \$16,000, sank \$4,000 of his savings, and

borrowed several thousands more. And the Nelson Stud-Welding Corp. almost went broke.

One year later, however, the gross exceeded a million. In 1944 the company was sold for \$15,000,000. Nelson's personal share: \$3,000,000.

So it does happen. Independent inventors—bucking the degree-loaded research teams in laboratory palaces—get two out of every five patents. More surprising, they win the lion's share of the valuable patents. Sixty percent of the important inventions come from the loners working at home or in small companies.

Two young musicians started working on what became Kodachrome color film in the bathroom of a New York apartment; one employee of a two-bit St. Paul company invented Scotch tape; an obscure RAF officer created the jet engine;

a couple of lab men at a small fabric-printing outfit in England discovered Dacron.

The stakes are high—and so are the odds against you

There's a dark side to the picture, too. So many new ideas are born, and the struggle for acceptance is so fierce, that all but a very few inventions languish and die without earning a nickel.

One respected broker, who has built a profitable business for himself by promoting other people's inventions, confides that he serves about 1,000 clients a year. On the average, he completes a sale for three of those hopeful 1,000.

A good invention is only the beginning

You have to start with a good invention. (Naturally yours is.) But that's the small part of the job. Commercializing it requires more ingenuity and hard work than the original invention did. Today public and private agencies are anxious to help you. New products and processes are in greater demand than ever before.

Uncle Sam offers inventors a helping hand

At least three Federal agencies make an effort to help independent inventors:

The Patent Office, besides offering advice on patent procedure and a roster of patent attorneys, makes a stab at publicizing inventions. When your patent is issued, it is described in the widely read Official Gazette. For \$3, you can have it summarized in a special list of patents available for sale.

The Small Business Administration

In 1940, George Nelson was a mechanic bolting down deck plates in a San Francisco shipyard. Too slow for wartime. So he invented a welder.



Two young musicians started working on Kodachrome color film in the bathroom of a New York apartment.

(local offices in several cities) gives advice and also publishes a listing of inventions for sale.

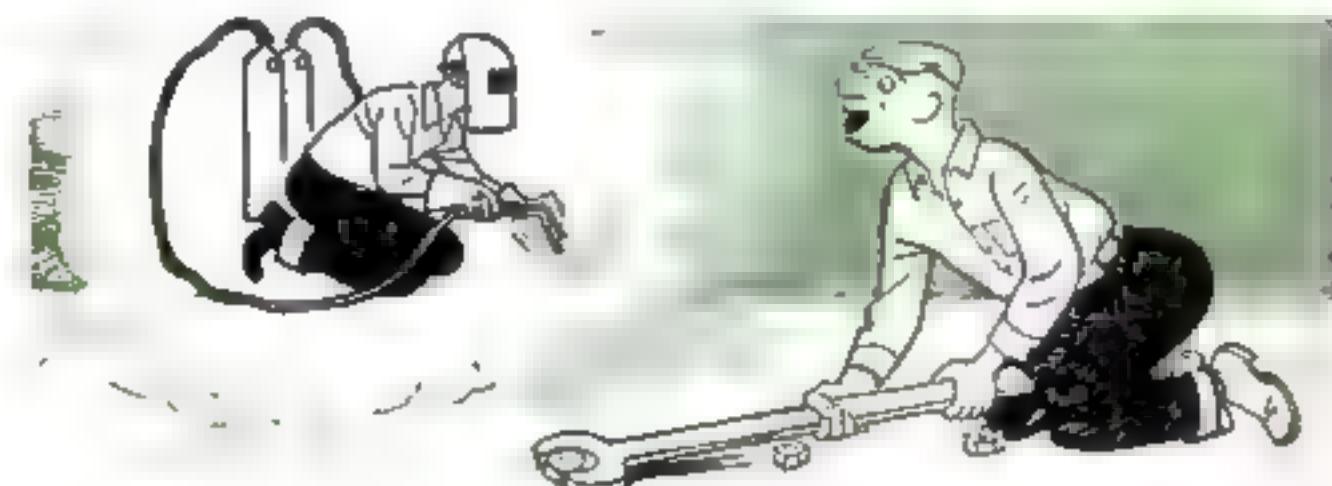
The National Inventors Council (Washington 25, D. C.) hunts ideas for the Armed Forces, which take over the development of the promising ones.

But how do you go about selling it?

Anyone who counts on Government listings to fix him for life with royalty checks is more likely to end up broke. A successful inventor has to be a persistent salesman.

You can advertise your invention (*Wall Street Journal*, *New York Times* Sunday financial section), but cheaper and closer to the bull's-eye are letters direct to manufacturers (address the patent department). Your chances? A survey of top patent counsels by the industrial magazine *Design News* revealed this:

You'll get polite consideration from two out of three companies. However, only one in six encourages outsiders to





Anyone who counts on government listings to fix him for life with royalty checks is more likely to end up broke.

submit ideas, and a bare 1 in 20 actively solicits them. Among the least receptive: automobile and airplane manufacturers.

Choosing the right company to approach

This is probably the biggest secret of success in marketing your invention. The pros go after firms that can *sell* the product, not the ones equipped to manufacture it. A leather-goods outfit will be less interested in a new idea for tool cases than a tool manufacturer. The tool company already has customers for the cases, and gets somebody to make them up.

This problem solves itself if you invent an improvement for a standard product. Jacob Rabinow, the inventive genius who developed the magnetic clutch, knew where to offer licenses for his self-adjusting watch movement (a tricky linkage automatically resets the regulator every time you correct the hand setting). Only watch and clock makers would be interested. They were. It is now a feature of many wrist watches and auto clocks.

Things worked out differently for Walter Haskins. He was sick in bed one day, but kept busy on the phone. While juggling phone directories, he thought up Redyref—the rack that suspends a row

of books on a rod so that any one book can be swiveled up to flop open, atop the backs of the others. The obvious customer for this invention was the telephone company (for the rows of directories at busy public booths).

Haskins made his pitch and was cold-shouldered. Not only that, but when he sold a few to hotels and offices the phone company angrily ordered them removed. One building owner retorted that if Redyref went, the phones went, too, winning that skirmish. But total victory didn't come until Haskins interested W. & J. Sloane, the home-and-office-furnishings outfit. One of its big customers is AT&T. Having sold the firm that already served his ultimate consumer, Haskins had it made.

One way: spend money to make money

Invention brokers will take on the job of pushing your idea for you. They usually charge a flat fee (\$75 to \$100) plus a small commission on the sale. The honest ones (and there are plenty of the other kind) tell you frankly what they do for the fee: circularize manufacturers who might be interested, follow up on those who respond to the inquiry, and finally attempt to close a deal.

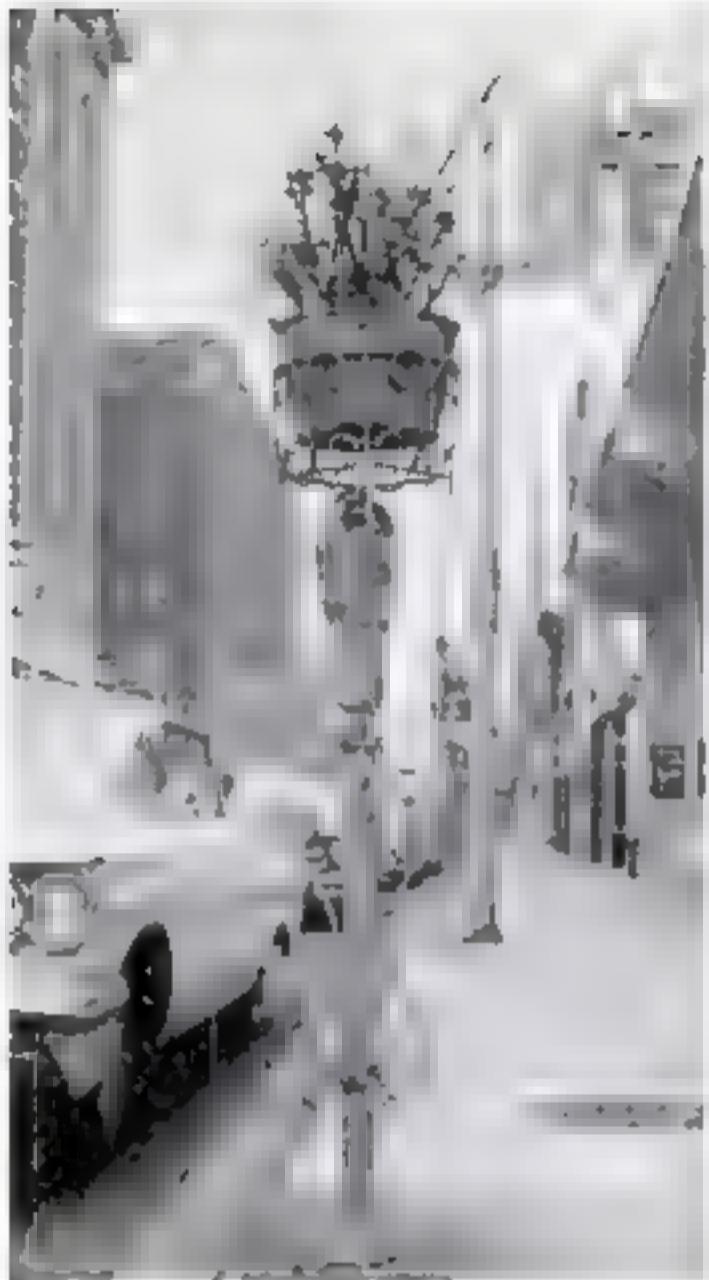
This panned out for Fred F. Cannon. A small-scale contractor, he invented a post-hole digger, built a couple for his own use, and found that they saved time and man power. As soon as the patent was issued, Cannon signed up with K. O. Kessler of Fremont, Ohio, one of the better-known brokers.

Kessler's staff mimeographed a page-long letter describing the digger, and sent copies to some 30 prospects culled mainly from a private file. Most (including the Government's National Inven-



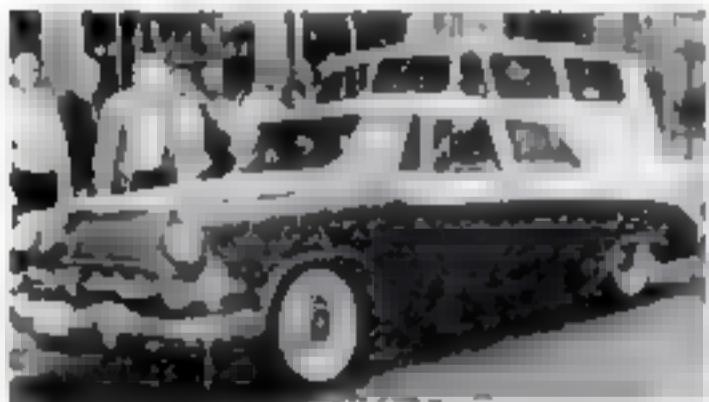
The fat cats are ready and eager to ante up because of the way the Federal income-tax laws work out.

[Continued on page 191]



Parking meters flower in season

Flowerpots on the parking meters should make Erie, Pa., motorists drop their coins in the slots with a right good will. The pots, held in place by decorative iron scrollwork, add a touch of color to the city, and may even take some of the curse off the doleful business of renting parking space on the street.



Double-decker Dodge

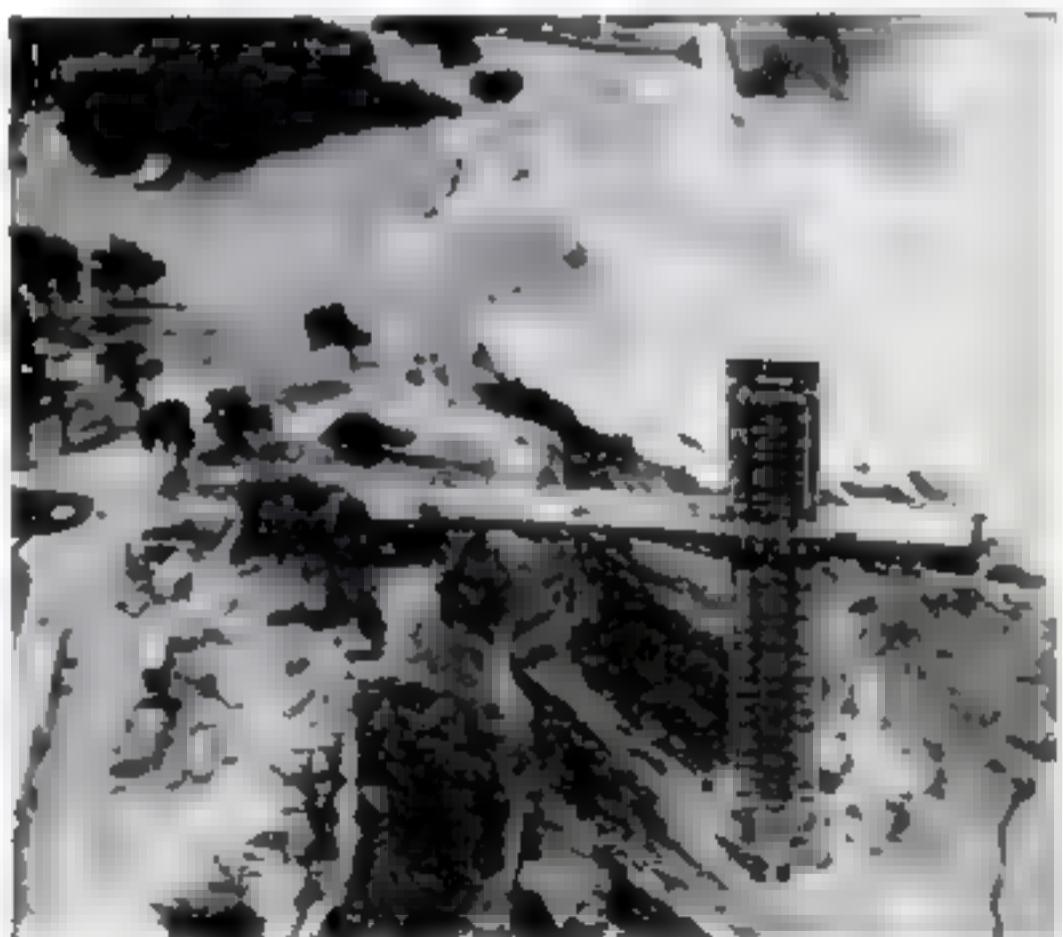
A panoramic view and seating and sleeping room for three are features of the homemade upper deck of this '56 Dodge.

Owner John Swanberg of Minneapolis (shown leaning on the fender above) built the extra deck in his spare time for \$1,000.



For well-dressed scientists

The only way to put on the coveralls above is to crawl into them feet first through the tunnel at the back. British scientists get in that way to do their work in sealed radioactive rooms.



Restoring view at Niagara

The observation tower shown under construction here is being completed on the American side at famous Niagara Falls. It replaces Prospect Point, a favorite tourist attraction for more than a century until it collapsed in a rock slide in 1954.

What's Coming

Today...



*Big motors now
are reliable, but also
both heavy and
fuel thirsty.*

By Hank Wieand Bowman

NO GREAT excitement surrounded the unveiling of 1961 outboard motors. A maximum-horsepower plateau, well under the 100-hp. mark, has been temporarily reached. There are refinements: more sound damping, a trend toward fixed carburetor jets and larger alternators, more use of thermostatically controlled cooling, new contouring of lower units, and increased application of shock absorbers on tilt mechanisms.

Nearly all outboard manufacturers claim "improved fuel economy." But fuel thirst is still an Achilles heel of their power plants.

In general, 1961 can be looked on as a year of refinement and restyling of existing models. Yet the outboard manufacturers can't afford to repeat this retreading process in 1962. Rumors fly inside the business of exciting developments in the offing—everything from supercharging and fuel injection to blue-sky dreams of free-piston and turbine power plants. By 1965 you can expect radically changed detachable motors.

It is this word "detachable" that governs the future of the outboard. Since boat designs are not expected to change materially, and since the outboard manufacturer must protect his market against further encroachment by inboard engines, particularly by the new *outdrives* (inboard engines with outboard units), you may expect the outboard to continue in its present basic format, which offers advantages over competing power packages.



Hank Wieand Bowman, America's most famous boating writer, has almost lived afloat for the last three decades. A skipper of a PT boat in the South Pacific and the English Channel during World War II, and a commander in the Navy in the Korean War, Bowman now travels some 40,000 miles a year to try out new motors, boats, and waters. The author of 12 books and more than 1,000 magazine articles on technical aspects of boating, he also finds time to write "Water Line," a nationally syndicated newspaper column.

This article, a prediction of what's coming in outboard engineering in the next few years, is the first of a series that Hank Bowman will write for POPULAR SCIENCE.

in Outboard Motors

The outboard's virtues. By this I mean that the outboard motor will continue to be built with detachable, clamp-on securings so that an owner may transfer it from boat to boat with a minimum of effort. It will continue to feature a tiltable drive unit, so that outboards may be operated in shallow water or beached at will. The power head will be retained in its present location—outboard of the hull proper—to take advantage of the safety factor afforded by this location: freedom from bilge fumes and the threat of explosion, and freedom from the mess and hazard of fuel accumulation in cockpits and bilges.

The outboard's location, coupled with well-designed shock-sound-dampening, and vibration-isolation mountings, plus an underwater exhaust system, makes it quieter now than all but the most exceptional inboard or outdrive installations. Yet the outboard manufacturer is faced with two basic problems: higher fuel costs due to the greater fuel consumption of the two-cycle versus four-cycle design, and the approaching upper limits of weight and size, which seem to preclude any great horsepower advance without loss of the detachable advantages. Both drawbacks will be overcome within the next few years.

What won't happen. Don't expect, however, a swing to either four-cycle or diesel designs as solutions to the fuel-consumption problem. Discount the four-cycle because of the weight factor, as well as the greater adaptability of two-cycle design to constant high-speed operation. Four-cycle marine engines (without reverse gear, prop shaft, struts,

CONTINUED

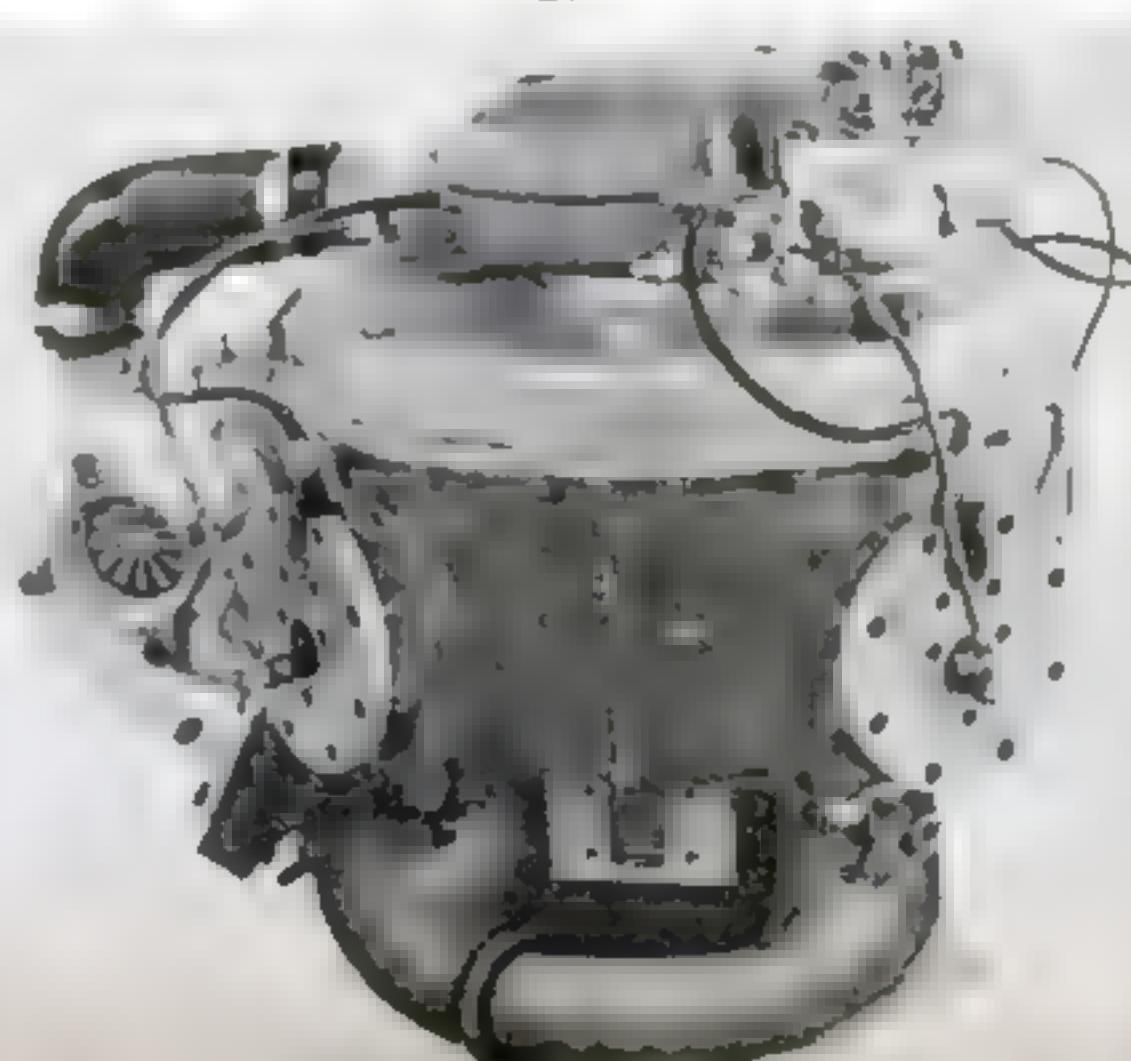
Tomorrow?



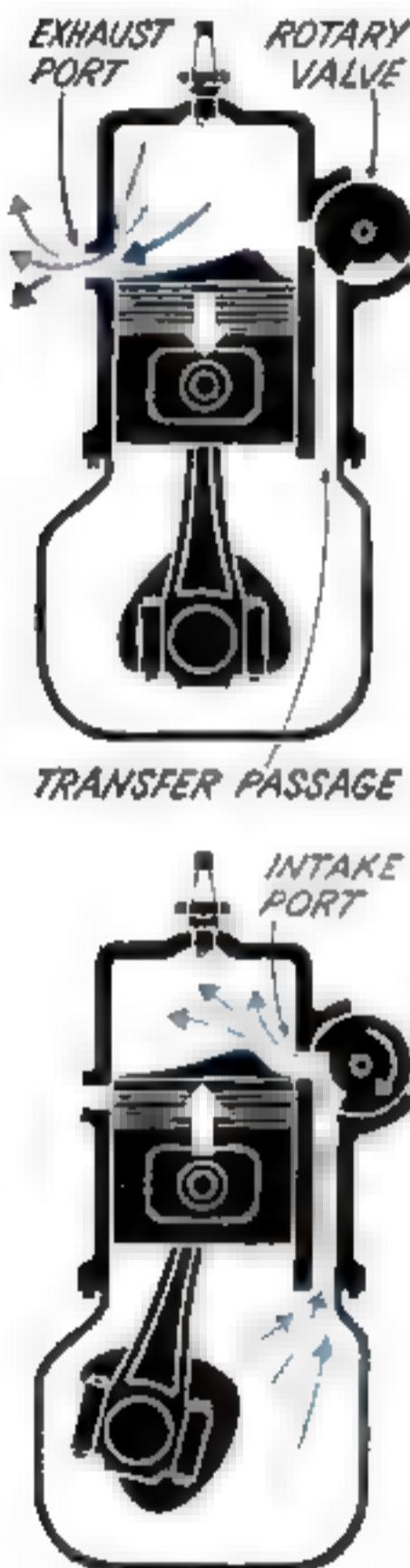
One nonproduction model has many design features now in the offing.

This is the power head of the experimental Scott engine shown above at right. It is a four-cylinder radial.

Displacement is 90 cu. in.; output is 125 hp.; and fuel consumption is .55 lb. per hp.-hour. The turbosupercharger adds 15 hp. at full throttle. Engine has oil pump and sump. wouldn't need a mix of oil and gas.



Rotary valve could improve port timing



With a rotary valve added to the transfer passage, there would be a longer "blow-down" time for exhaust scavenging, and no loss of the fresh charge out the exhaust. This would be a fairly simple way to improve two-cycle efficiency.

rudder, and propeller) have a specific weight of about 4 to 4.5 lb. per horsepower. Though the broader use of aluminum alloys to replace cast iron will unquestionably trim this somewhat, the largest outboard two-cycles currently have a specific weight of about 2 to 2.5 lb. per horsepower. By 1965 the weight-to-horsepower ratio of the outboard will be even more favorable.

Remember that the outboard manufacturer wants to keep his power plant detachable. So he isn't about to give up the weight-to-power advantage offered by the two-cycle design. This consideration would also eliminate the diesel, even if its far greater cost per horsepower weren't a factor.

Granted, diesel outboard motors are already being produced. But pleasure-boat versions are available only in small sizes (10 hp. and under). In this modest power range the diesel outboard has a limited specialty application, where its high initial cost and weight, plus inherently rough operation, are no deterrents. To view the present low-power diesel outboard as economical is about as practical as looking on a cigarette lighter designed to burn diesel fuel as a real dollar saver. Only in far higher-power versions would the fuel economy of an outboard diesel overcome its disadvantages. Excessive weight in the larger versions currently rules it out for small pleasure craft.

The distant gas turbine. One manufacturer recently announced a contract to design a 125-hp. outboard gas-turbine engine for the U. S. Navy. The power unit will employ a heat exchanger so that normally wasted exhaust heat will be reintroduced into the engine to provide more efficient use of the fuel. Delivery is scheduled for 1962. Including the drive unit, it is expected to weigh two pounds per horsepower. But will it be available to the pleasure-boating public? Perhaps in the distant future; certainly not within the next five years.

For one reason, listen to Dr. Gordon Millar, a gas-turbine expert formerly employed by Ford and now assistant chief engineer for the McCulloch Corporation: "Pleasure-boat outboard motors as we recognize them today will not go to gas turbines in the near future since they cannot be produced competitively with die-cast engines."

In reasonable quantities the lowest production cost of gas turbines of single-spool design would be about \$15 per horsepower. This would mean that an 80-hp. gas-turbine outboard would today cost its manufacturer about \$1,200 a unit, or around \$2,000 by the time it reached the consumer. Fuel consumption of the single-spool design would be no better than a pound per horsepower-hour. In larger sizes, incorporating the more costly heat generator, fuel consumption would be about .6 or .65 lb. per horsepower-hour. Though turbines may ultimately replace reciprocating engines, a major breakthrough to bring the costs down will have to come first.

Gyro effects. Engineering problems would arise in applying the gas turbine to small craft. One is the gyro action created by the rapidly revolving turbine rotors (in the neighborhood of 40,000 r.p.m.), which would cause steering problems. Another is the relatively narrow operating range, though segmented nozzles may some day give the gas turbine

the wide speed range that is required by pleasure boats.

Early application of atomic power to the outboard certainly will not come within the next decade. Space and weight requirements for shielding make it improbable.

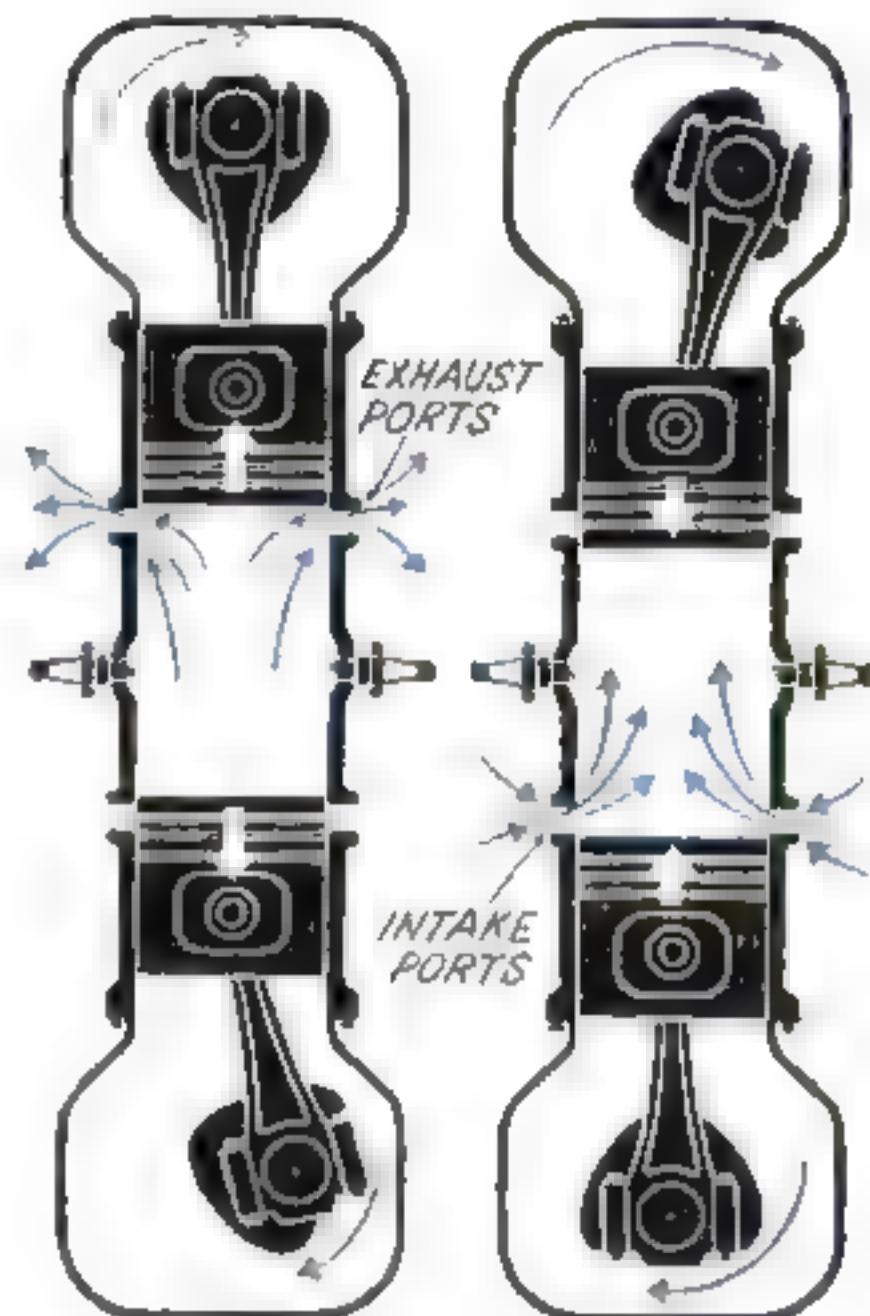
The free-piston engine, a hybrid that develops no direct mechanical power but delivers exhaust gas under high pressure, could be used to run a turbine. It has the advantage of extreme light weight, since it has no crankshaft, connecting rods, or flywheel. But too many engineering problems remain to be overcome for it to be packaged for the consumer even by 1965.

In five years: If you talk informally to engineers at Evinrude, Mercury, and Scott, you'll find basic agreement on the future. Power will probably not exceed 125 horsepower. Marketable motors will still be prop-driven. Two-cycle engines will still be used, but will be inherently balanced, eliminating most vibration and shock dampeners. Horsepower-to-weight ratios will be further improved, and fuel consumption may drop below .5 lb. per horsepower-hour. Although the two-cycle engine is already impressive on the basis of horsepower per cubic inch (the present Merc. 500, for example, develops 50 hp. from 44 cu. in.), more efficient designs will make possible outboard engines developing two and three hp. per cubic inch within the next few years. Further refinements of specially designed two-cycle lubricants will cut current oil costs nearly in half. This year McCulloch will market an outboard oil engineered for a gas-to-oil ratio of 40:1. This and other new outboard oils (Ashland and R.P.M. are two) will cut oil expenditures to under two cents per gallon of fuel mixture.

Dream jobs. Just as automobile companies have built radical vehicles—both to explore new designs and to win publicity—the outboard industry will display a rash of experimental engines. The first few will appear in 1962. These will unquestionably include gas turbines, free-piston engines, water-jet, and even air-jet propulsion. Some will be mere drawing-board conceptions, others dummy mock-up designs for publicity, and a few will be experimental working models. Manufacturing costs and engineering bugs will keep most of these Jules Verne deals out of the consumer's hands.

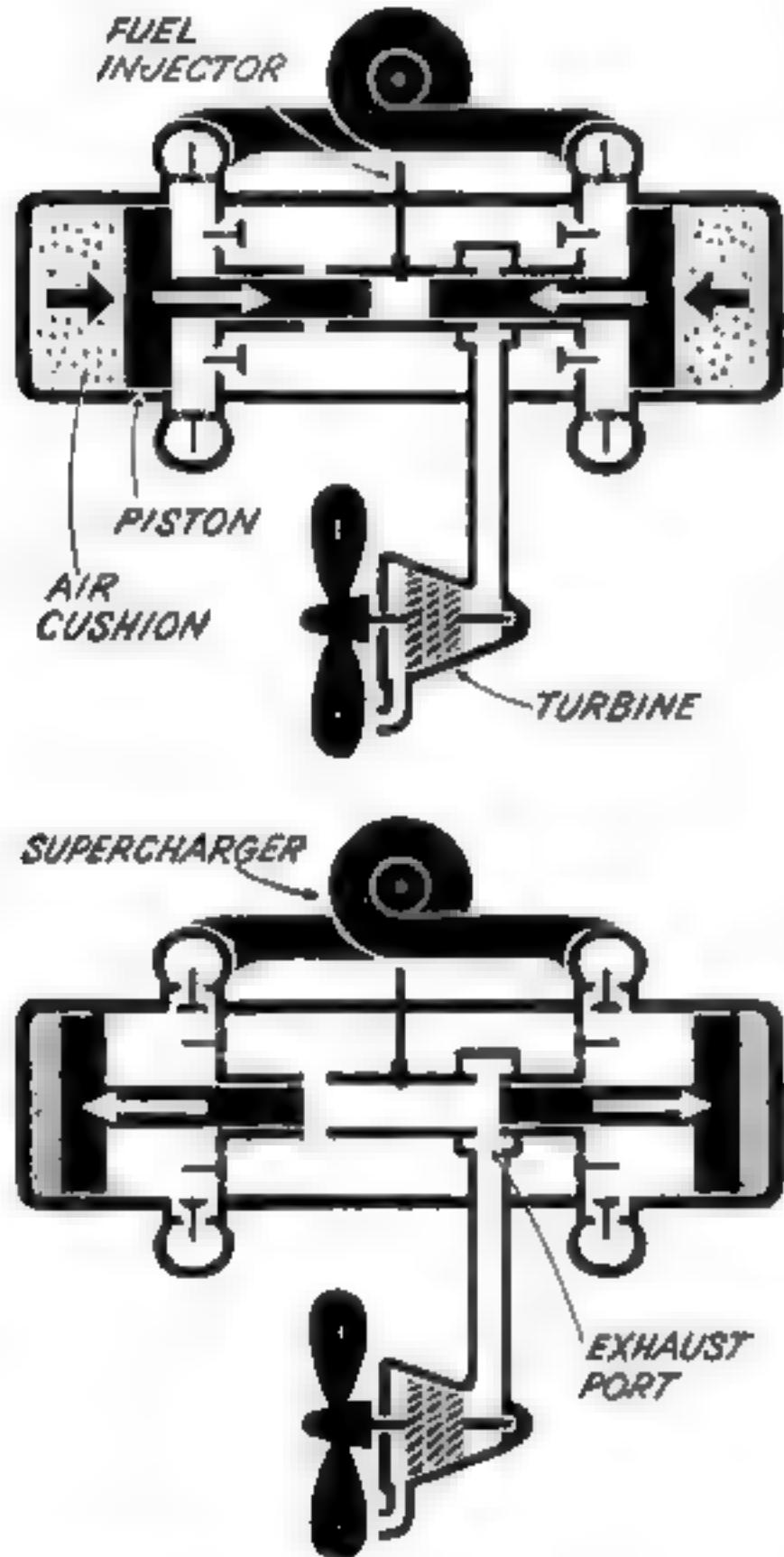
The two most striking features that will actually be incorporated in large outboards by 1965 are fuel injection and superchargers. Internally the main design change will be a shift from symmetrical to unsymmetrical timing to improve breathing. Present outboard motors use symmetrical timing. With this design the exhaust port is opened before the fuel intake or transfer port, and the exhaust port closes after the intake port. Since the exhaust ports open sooner and close later than the intake ports, some of the fresh fuel charge

"Uniflow" design might save fuel



A two-crankshaft design, with the pistons tied in fixed relationship by gears, would permit longer, more efficient scavenging of the burned gases—yet without wasting any of the fresh incoming mix out the exhaust. But the extra weight and cost would be big penalties.

Free-piston outboards may come—but not soon



A free-piston engine is a fine producer of hot gases to drive a turbine. Its power and potential efficiency might make it a fine outboard. But many engineering and cost obstacles would have to be overcome first.

escapes out the exhaust ports. This increases fuel consumption and decreases thermal efficiency.

Crankcase a poor pump. Another limiting design feature of current outboards, one which also contributes to inefficient scavenging, is the use of the crankcase as a precompression chamber. The pumping capacity of the outboard crankcase is too limited, and its scavenging efficiency too low, to be tolerated in the search for more power from a lighter, more economical engine.

Unsymmetrically timed two-cycle engines will make their appearance. Superchargers, far more efficient than crankcase precompression for both fuel-vapor pumping and exhaust scavenging, cannot be applied efficiently to engines with symmetrical port timing; but they work fine with unsymmetrical port timing.

Two-cycle engineering designs have long existed that will provide efficient substitutes for the cross scavenging of symmetrically timed engines. One choice open is the use of a rotary valve between the transfer passage and the inlet port. This allows a lengthier blowdown or exhaust-scavenging period, and at the same time allows fuel to be transferred from crankcase to cylinder after the exhaust port has been closed.

Another unsymmetrically timed version is the "uniflow" design. This is a double-piston layout that uses two crankshafts—one at either end of the cylinders—connected by a gear train. One piston controls the exhaust ports, the other the intake ports. The scavenging period can be double or triple that of a cross-scavenged single-piston design. Both intake and exhaust ports can be enlarged since each can occupy the same relative amount of space that both do on cross-scavenged designs.

Good-bye carbs. Regardless of which unsymmetrically timed design is chosen, fuel injection replacing conventional carburetion is a certainty, for injection mates with two-cycle designs like a knob with a door. The deterrent to date has been cost. According to Lowell Haas, Scott's chief engineer, fuel injectors will within five years cost only from \$3 to \$5 more per cylinder than conventional carburetion, making their use practical.

Greater volumetric efficiency will be obtained because metering between cylinders will be more perfect and the combustion chamber can be more thoroughly scavenged (since air rather than a fuel-air vapor mixture will be used for scavenging). Haas and his engineers already have a working four-cylinder radial outboard fitted with fuel in-

[Continued on page 192]

What's New Afloat

Outboard Skimmers. The Skip-Jack at top right will do 40 m.p.h. with a 25-hp. motor. It has a four-by-eight-foot fiber-glass hull eight inches thick at stern, tapering to two inches at bow. The power skis below it are two styrofoam-filled fiber-glass pontoons held rigidly together. An 18-hp. engine will propel them at speeds up to 24 m.p.h. Without motor: Skip-Jack, \$395. Hinkle Contracting Corp., Paris, Ky. Power skis, \$475. Jack Drury, Gill Hotels, P. O. Box 4037, Ft. Lauderdale, Fla.



Quick-Release Shoes. Even when tightly laced, these boating shoes can be loosened instantly in a man-overboard emergency. Four snaps secure each laced flap; one pull and the shoe slips off easily. Nonslip felt soles give sure footing on slippery decks. Price is under \$10. International Shoe Co., St. Louis, Mo.



Boat-Launching Trailer. The heaviest boat can be launched and retrieved automatically by this extending-boom trailer. When towed by a car, the trailer is of conventional length. At launching site, boom slides out and eases boat into water. Smallest size (top photo): \$184. Noramgrex, Malden, Mass.



What's New Afloat continued

Car-top



Portable Sailboat. Convenient car-top transportation is offered by the under-50-pound Sea Snark. The 11-foot-long, 38-inch-wide hull is made of lightweight



Koppers polystyrene; the 45-square-foot sail is polyethylene film; and mast, spar, and boom are aluminum. About \$100. Snark Products, 40 W. 57th St., NYC.

Sandwich Hull. A five-ply laminate with foam-plastic-rubber core, hard plastic-rubber sides, and a weather-resistant rubber skin is being used to make strong boat hulls with built-in flotation and insulation. It's manufactured by U. S. Rubber Co. for the Thompson (photo at left), Custom Craft, Carter Craft, and Connecticut boat lines.



Aluminum Pier. This pre-fabricated dock comes in eight-foot sections for easy out-of-water assembly. Each section with standards weighs only 45 pounds. It won't sink into soft bottoms, and will withstand gale-force wind and waves. Sections cost \$74 and up. Alumidock, Randolph, N. Y.



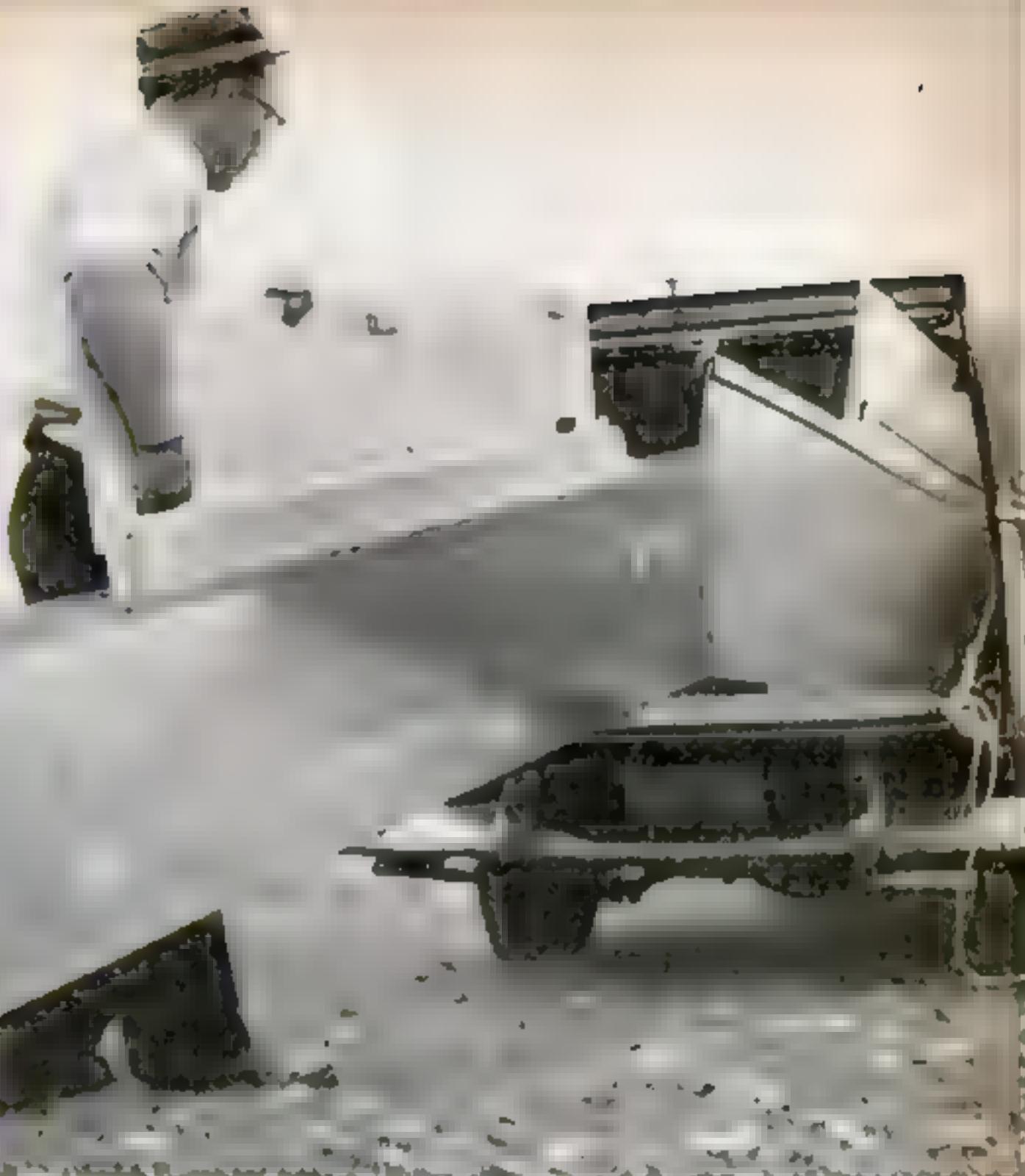
Sail Motorboat. The hinged mast on this sailboat tilts for low bridges or comes down entirely within 15 minutes to convert the craft to an outboard-powered cabin cruiser. The unsinkable 17-foot hull is of molded fiber-glass. Total sail area is 180 square feet. Picnic 17 sells for \$1,985. General Boats, NYC.



Luminous Paddle. Emergency paddle also serves as a distress signal. Finished in fluorescent paint, it is visible for more than 1,500 feet on a clear day when waved to and fro. It has been adopted by many outboard clubs. Wait Mfg. & Sales Co., 415 N. Elwood, Tulsa, Okla., markets it for \$1.

BOATING

1961



New Hinged Boat Folds Flat

From stem to stern, the keel's a sealed piano hinge. When the day's fun is over, the hull collapses. Here's how to build it

By Alfred W. Lees

PS PHOTOS BY W. W. MORRIS

EVER see a piano hinge turn a corner? The one incorporated into this remarkable boat does more than that. It forms a broad U, running continuously down the bow, along the keel, and up the stern of the canoe-like hull.

By introducing the hinge principle into boat construction, you're able to collapse ribless, lightweight aluminum hulls for easy portage. You can slip your flattened boat into a station wagon and still have plenty of room for

KIT MINOR, pulled apart for clarity, shows how aluminum sides are joined by brass pin driven down each bow to interlock the barrels. Gunwales pivot on channel brackets to expand hull.

From wheels to water: Launching is a five-minute, one-man job



1. AT ROAD'S END, one trip is all that's needed to move both lightweight units to the shore. Holes in deck serve as handgrips. Knee pressure



and a quarter turn of the earlock unlatches each half. The folded deck, hinged to both inwales, acts as a pry to spread the hull.



DESTINATION: ADVENTURE. And getting there is twice the fun with outboard power. Here

Darby is steering a 1½-hp. motor. Another photo farther on shows the boat under sail.

15 pivoting catches keep deck as sturdy as if it were one piece



2. WHEN DECK IS OPENED, buttons underneath are turned to catch steel bars projecting across hinged joint at each end. A push flattens the



cleated floor. After deck overlaps are joined, spanners attached at each end increase rigidity and provide motor mount and sail socket.

bulky camping supplies. Or lash the hulls to the top of your sedan and forget about a boat trailer.

Where do you buy a curved piano hinge? You don't. The edges of the hull's flat aluminum sides are crenelated and curled (with a homemade jig) to form their own hinge. The effect is similar to lacing your fingers together and pivoting your palms open and shut. How can a curved hinge work? The clue to its operation is that it opens least at the curved points. There's enough play between the barrel sections to permit this limited pivot as the gunwales arc apart and the aluminum sides become concave.

But can it be made watertight? Easily, with modern materials. Epoxy-resin cement bonds fiber-glass tape across the hinge, and latex seals against leaks.

Although the ingenious collapsible feature is valuable in a canoe, its worth is more than doubled when applied to a catamaran. The chief disadvantage of these twin-hulled boats is their clumsy bulk out of the water. They take up to three times the storage space of a conventional boat and are awkward to transport.

To overcome both objections, Newman Darby of West Pittston, Pa., developed the hinged version shown here. As the hulls are collapsed, the attached floors



3. SHOVE OFF AND YOU'RE UNDER WAY. The oar horns slip into the top of the projecting locks for comfortable one-man or two-man rowing.

and overlapping plywood decks also fold, converting the catamaran into two 5"-thick units weighing less than 70 pounds apiece. These units can be stored along the wall of the garage, ready to load in (or on) your car. When the launching site is reached, one man can trot them both down to the shore, and assemble them into a craft that can be propelled with oars, a sail, or a small outboard.

Materials for this 12' catamaran should run about \$75. The large .051" aluminum

How to make the keel, floor, and deck hinges



BARREL TABS ARE CUT on several pieces at once with a saber saw. Stack the blanks and apply C clamps. Lay out tab widths with jig. Scribe length-line with sharp-pointed marking gauge.



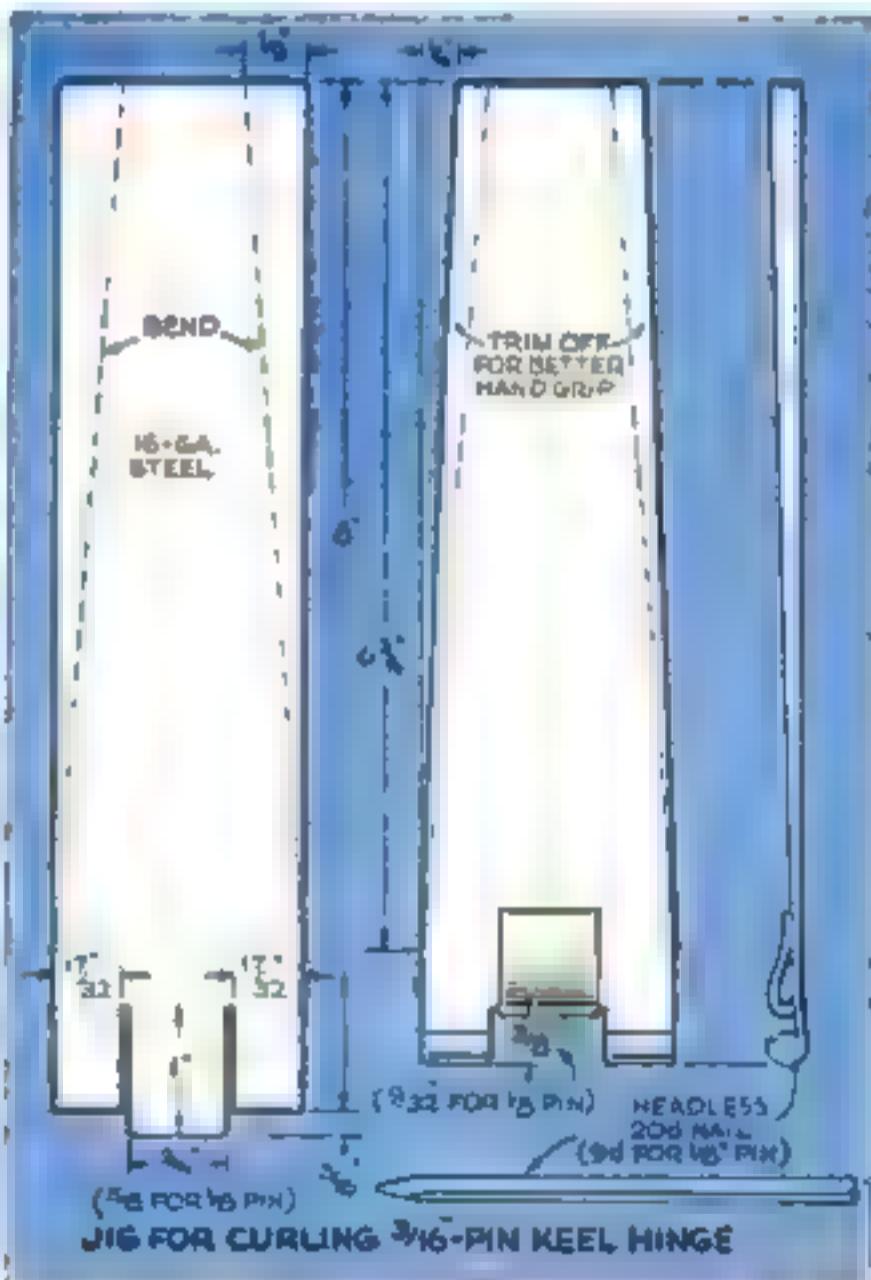
UP-AND-DOWN pliers twist breaks out alternate sections. Note that these are marked for removal on matching pieces to prevent error. Lay jig's pin along line, bridging two gaps.



HOOK JIG UNDER PIN and bend one tab up and over until jig rests on face of work. One end of pin is inserted in previously curled tab; pliers hold other end. End tabs are tricky.

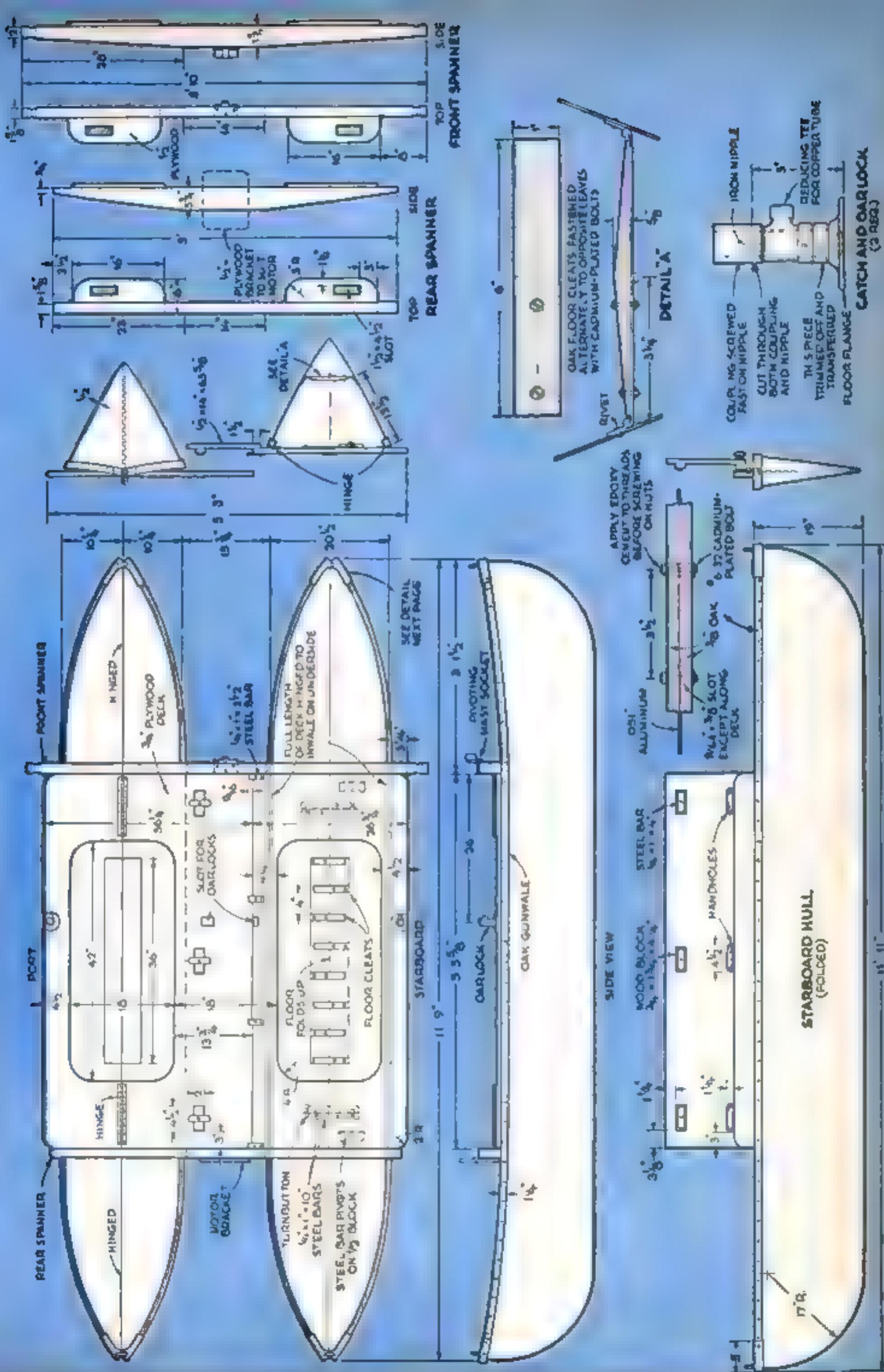


CRIMP BARREL SECTIONS SNUG after joining both leaves with hinge pin. Saw kerfs give enough play—even on curved keel sections. For these, use bent jig pin seen in photo above.



JIG FOR CURLING HINGES must be made in two sizes. Size shown is for the $\frac{3}{16}$ "-pin keel hinge. Jig for the $\frac{1}{8}$ "-pin floor and deck hinges is identical except for dimensions noted.

COMPLETE PLANS AND DETAILS for constructing the catamaran appear at right. Side and end views are given for both open and folded positions to indicate how hulls change shape.



sheets can be secured from distributors listed in any classified directory. Specify an alloy in the 5,000 series, of half-hard temper. Or you may be able to buy H-12 building sheets at a sheet-metal house.

This boat was born to adventure. Darby built the high-riding craft for field trips into remote shallows of the Susquehanna River. His search for Indian relics requires a good deal of portage, and light, fold-up hulls were the answer.

Perhaps your boating needs are simpler. But if it's fun you're after, a catamaran will double it. As a party boat, it welcomes aboard four at a time, for face-to-face conversation. As a diving raft, it's virtually capsize-proof.

Snipping the hulls. You can make the entire boat. Just snip all four hull sides from two 4'-by-12' aluminum sheets. Leave an extra $\frac{3}{4}$ " along the stem, stern, and keel line for the hinge barrel. The blanks can be stacked so that all barrel tabs can be cut at one time. The straight top edge of each blank is

sandwiched between two $\frac{3}{8}$ "-by- $1\frac{1}{4}$ " oak strips and fastened with bolts every $3\frac{1}{2}$ ". The bolts along the identical fore and aft bows must pass through slots that permit side play, because the gunwale curves

during the spreading of the hull (see detail). The section amidships, where the deck is hinged to the in-wales, may be snugly bolted through $9/64$ " holes.

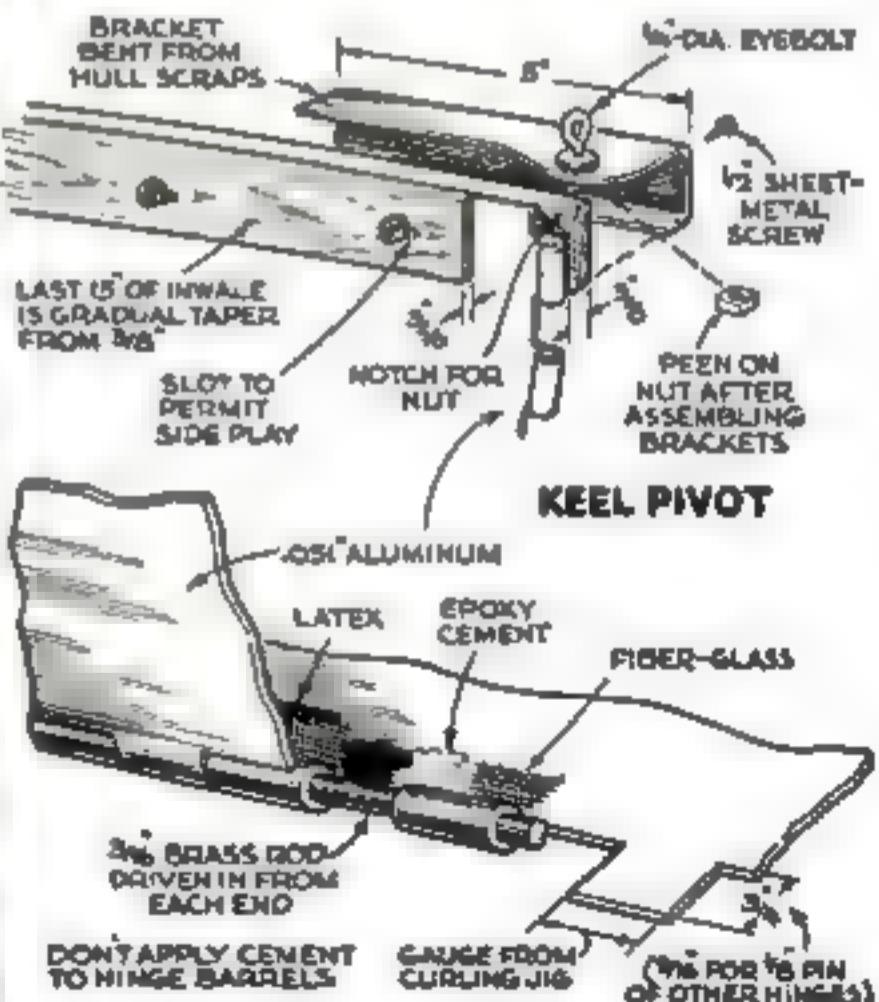
The pivoting gunwale brackets are put in place temporarily so that the eyebolt hole can be drilled right over the end of the brass hinge pin. Remove the brackets, fasten the eyebolt through the lapped top flanges, and screw the brackets to the gunwales.

The four hinges needed for each folding deck may be purchased, or you can make them with the smaller curling jig. This jig is also used to curl barrels on both edges of the two floor leaves required for each hull. Assemble these units to leaves riveted to the inside of the hull. The rivets must be sealed with spar varnish or epoxy.

How can a hinged keel be watertight? The answer's inside



A SEALED JOINT DOES IT: After pin is driven in from each end and the pivoting gunwale brackets are attached, tape is bonded across the hinge and covered with five coats of latex.



BOATING
1961

Boat Buoyancy Now Comes in Cans

Like dumping cake batter into a pan—you just pour the chemical foam into all the nooks and crannies

By V. Lee Oertle

YOU can now sinkproof a boat with two cans of chemicals. Stir the contents together, pour the liquid into empty spaces in the hull, and—presto!—it foams up and fills every nook and cranny with a plastic foam of great buoyancy.

The plastic foam is the same familiar white, cellular stuff you've seen in solid blocks. The new liquid form was developed after years of struggling to fit the blocks into small, odd-shaped, inaccessible spaces. Now even the tiniest and most awkward spots are easy to fill.

The liquid begins to foam up almost

immediately when it's poured in, expanding to 35 times its original volume. Each cubic foot of the foam weighs only two pounds, yet will support 60 pounds of extra weight when it's submerged.

The foam-in-place plastic also adds tremendous strength to a hull. It bonds itself to the inside, forming a tough, reinforcing backbone that can withstand pounding that would un-seam an ordinary hull. The millions of tiny cells in the foam are filled with gas and sealed closed so no water can seep in even if the plastic is gashed or punctured.

The liquid plastic is sold packed in



Test setup shows how the foam swells 35 times



MIX A FEW DROPS of the two chemicals in a pie tin for a dramatic demonstration.



IN 10 SECONDS, the gas-filled plastic swells and begins to overflow the pan.



THREE MINUTES LATER, the foam has expanded into the buoyant ball seen above.

kits containing equal parts of the two chemicals needed. One brand, Safety Foam, costs about \$35 for a two-gallon kit—enough for 12 cubic feet of expanded foam. A two-quart kit, producing three cubic feet of foam, is about \$11. Prices go down as the quantity you buy goes up.

How much foam? What you'll need for a boat depends on its flotation factor—the amount of weight it will support when submerged—and the extra weight that is put into the boat in the form of engine, passengers, anchors and other gear. The required buoyancy for various types and sizes of boats can be calculated from a chart called "Boat Flotation Formula," which can be obtained by writing to the Outboard Boating Club of America, 307 N. Michigan, Chicago.

As a rough guide, boats up to 14' in length generally require 400 to 500 pounds of extra flotation, or about 8 cubic feet of the foam. Boats 14' to 16' usually need 10 cubic feet; and boats 16' to 18', 12 cubic feet. This means that just about



TEMPORARY BULKHEADS cut from cardboard are used to seal off open spaces where liquid plastic will be poured in. Here, gaps below front seat are walled up so bow can be filled.

any average outboard can be sinkproofed with the two-gallon kit of chemicals.

How the foam is poured. Estimating exactly how much foam the liquid chemicals will make is tricky. For this reason, the plastic is poured in several layers until the desired thickness is built up.

In closed spaces, it's important to underfill slightly. If too much plastic is poured in, the tremendous pressure of the expanding foam may actually burst seams or bulkheads. Vent holes must be drilled in the sides of such spaces to let off gases that are generated by the foaming process. The holes also serve as safety valves to let the foam escape harmlessly if too much is accidentally poured in. In spaces that are open at the top, the plastic can be overfilled without danger. Letting it overflow and then trimming off the excess is, in fact, an easy way to get a neatly flush fill.

In open areas, the liquid plastic is held in place until it foams with temporary dams cut from cardboard and attached

with masking tape. The cardboard is waxed to keep it from sticking and can be peeled off easily once the foam has set.

The foam should be placed as close as possible to the heaviest part of the boat—usually the stern where the motor, battery, tools, and other gear are located. The waste space underneath the motor well in many boats is an ideal spot to fill with foam. Other good possibilities are under seats, along gunwales, and in the hollow spaces between frame members and double-bottom hulls. The bow area, almost always useless, can be filled solid with foam, making it practically impenetrable to floating objects struck at high speed.

And one causion: The fumes given off by the foaming process are toxic and can be harmful to eyes and lungs. Once a pour is made, it should be allowed to set 20 minutes before further work is continued. The Safety Foam plastic is sold by Marvel Plastics Co., 1250 N. Parker St., Orange, California.



FOAM IS TRIMMED OFF FLUSH after it has set, making it possible to fill open areas fully and evenly. The foam hardens in about 20 minutes, can be cut with a saw blade or knife.



PAPER FUNNELS make it easy to pour the plastic into closed spaces through holes. Temporary bulkhead, taped on, will be peeled off later, leaving a smooth surface on the foam.

Mechanics and Handicraft SECTION

HOW TO BUILD A Steam Turbine for the Savannah Model



Part III. Love fine machining? Here's a high-revving power plant that gives the trim ship an astonishing half-hour run

By Herbert R. Pfister

YOU feel the throb of live steam, hear the mounting whine of a high-speed turbine rotor winding up to full speed. That's the power plant in the model Savannah—an authentic, powerful steam turbine similar to the one that drives the real Savannah. A most unusual piece of model machinery, it makes a fascinating and rewarding project.

Despite the tremendous rate at which the miniature turbine gobbles up steam, it gives you a surprisingly long run—a full half-hour on a single filling of the boiler. Unlike many other forms of model power, it allows you plenty of time to send the ship on long voyages without constant refueling or the fear that she may run out of steam far from shore.

Built by Floyd McGuckin, an expert machinist, the little turbine is as delicate as a jewel, yet is designed to be simple and accurate in construction.

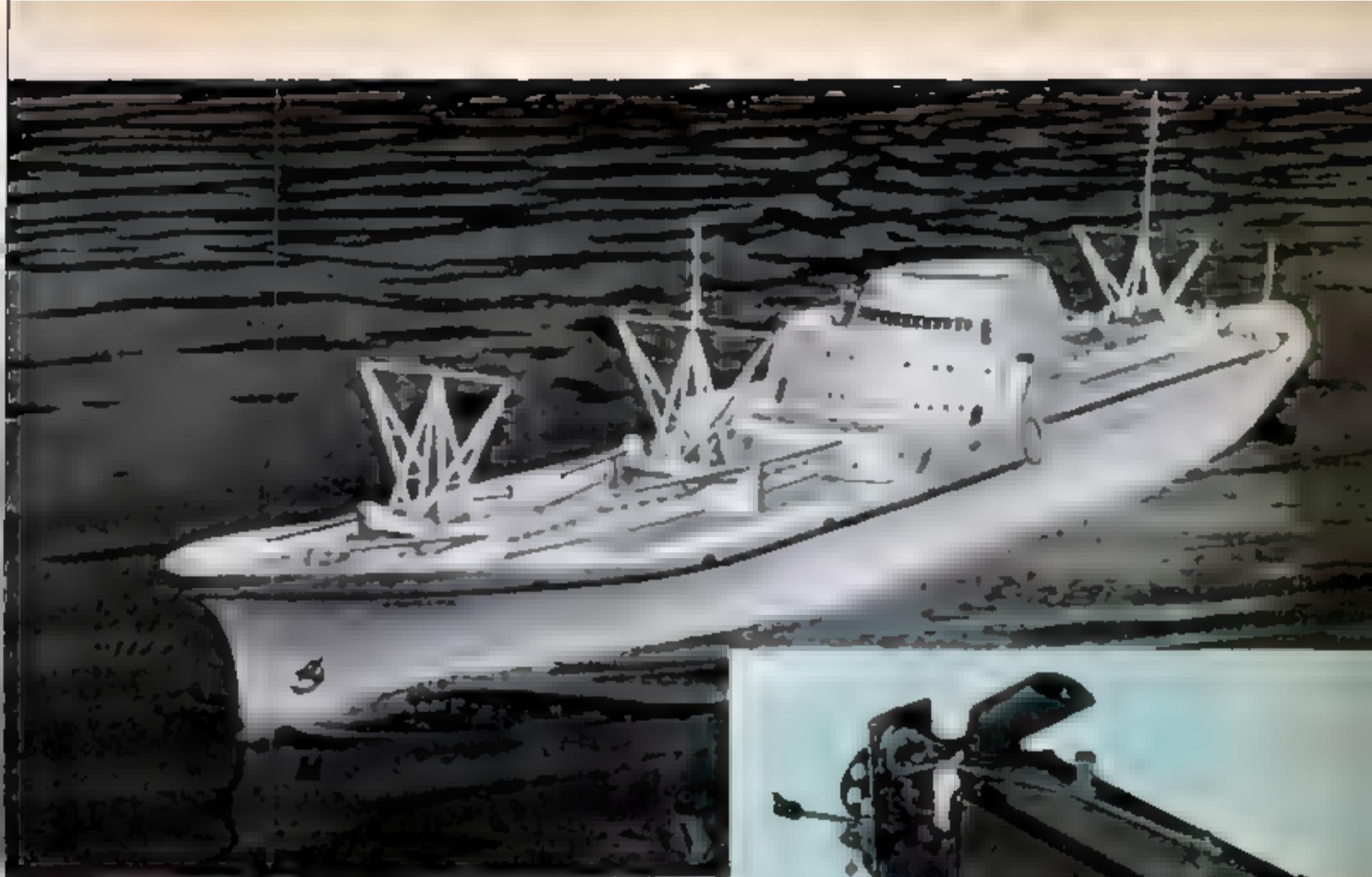
About the size of a silver dollar, the turbine rotor revs up to well over 5,000

r.p.m. under 50 pounds of pressure from a tiny jet of steam. The high revs are then tamed down through gear reduction to put out about 900 r.p.m. at the propeller shaft—enough to send the Savannah skimming along at a scale speed equivalent to her big sister's. Pull a lever and the mighty turbine goes into reverse, bringing the ship smartly to a halt or starting her steaming backwards.

The source of steam for the turbine is the only major difference between model and prototype: A nuclear reactor generates steam for the big ship; the little one gets her steam from alcohol burning on a cotton wick under a pint-sized boiler.

The rotor is the heart of the turbine. You could slot and bend a disk of sheet metal into a multibladed fan; but for maximum efficiency, the rotor should be machined from solid stock. Two easy-to-make jigs—one for indexing and one for cutting the blades—simplify the job.

Chuck a piece of $1\frac{1}{2}$ " machining-grade



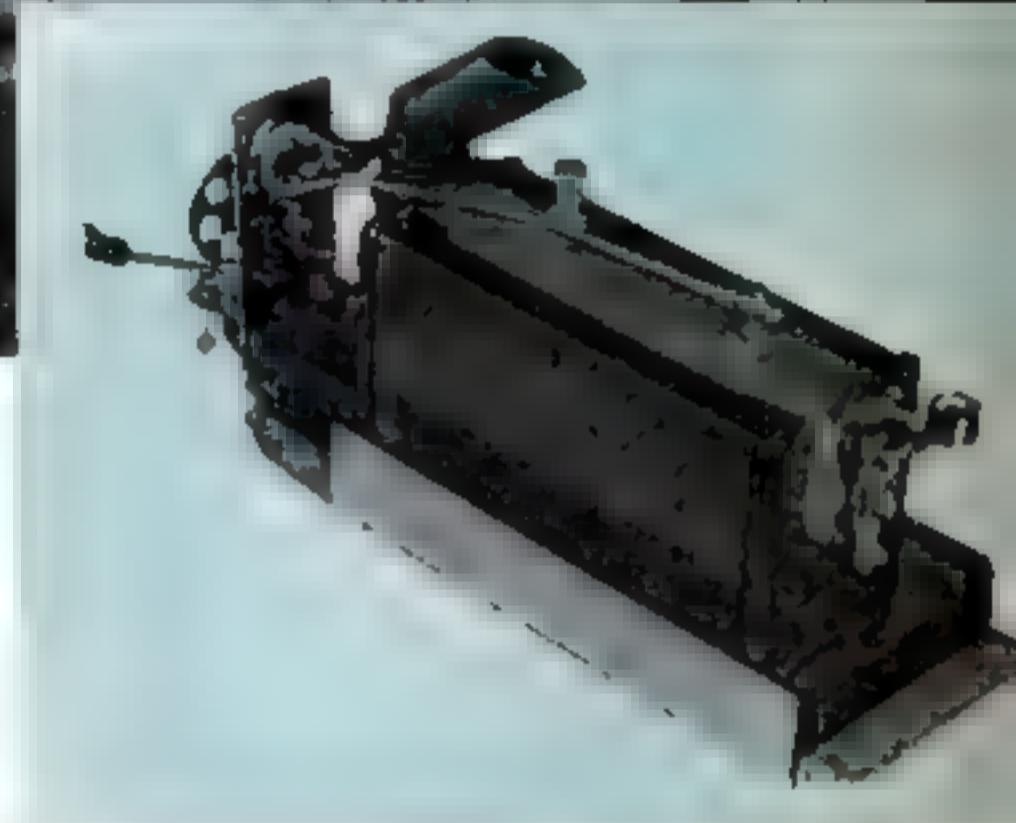
ROLLING UP A SCALE-SIZE BOW WAVE, the model Savannah knives along under power from its jewel-like turbine (left). Boiler at right generates 50 pounds of steam to spin the turbine.

aluminum in the lathe, take a truing cut to reduce it to $1\frac{3}{8}$ ", and drill a $\frac{1}{8}$ " hole in its center. From this, cut off several $\frac{3}{8}$ "-thick disks for rotor blanks.

Bolt one of the blanks to a toothed gear—you use the teeth as an easy indexing jig to establish the position of the rotor's blades. Since the rotor has 24 blades, you can use any gear having 24, or a multiple of 24, teeth. If you use a 48-tooth gear, you count every other tooth. McGuckin used a 72-tooth gear and counted every third tooth.

Clamp a V-notched piece of plywood to the drill-press table, and to this clamp a pointed strip of metal. Adjust the plywood so that when the gear is placed in the V notch a No. A centerdrill in the drill press will be $\frac{3}{16}$ " to one side of the center hole in the rotor blank. The No. A centerdrill—not a regular A-size drill—is important for precise hole spotting.

Press the gear into the V notch with one of its teeth lined up with the metal pointer and drill the first indexing hole about $\frac{1}{16}$ " deep. Then rotate the gear to



the next tooth you're counting and drill the second hole. Continue turning the gear until you have 24 evenly spaced holes $\frac{1}{16}$ " in diameter and $\frac{1}{16}$ " deep.

The blade-cutting jig is the second, and most ingenious, part of the rotor-making operation. Cut and file a step in the end of a $3\frac{1}{2}$ " length of $1\frac{3}{8}$ " aluminum rod. The step should be parallel to and slightly below the center line of the rod. At locations given in the drawing, drill and tap one hole for a stud, and drill a second hole $\frac{3}{16}$ " from the stud's center for the $\frac{1}{16}$ " indexing pin. The stud is made by cutting the head off a No. 5 machine screw.

Place a blank on the stud with the indexing pin engaging one of the 24 indexing holes and lock it in position with a No. 5 nut. Chuck the blade-cutter bit (see drawing) in the tailstock and slow-

HOW TO MAKE THE TURBINE



INDEXING HOLES are drilled in a $\frac{3}{4}$ " circle around the rotor blank to locate positions for the 24 blades. With a simple jig—a gear rotated in a V-notched block—you can use the gear teeth to line up each hole accurately under the drill.



LOWER THE BLANK on the cutting jig so that one indexing hole hits over the indexing pin. Fasten the blank in position with a nut on the threaded stud. Advance the tailstock slowly to take the first arc-shaped cut in the rotor blank.



ROTATE THE BLANK after each cut, aligning the holes with the indexing pin. Here, turbine is half completed. As the lathe turns, the jig swings the edge of the rotor blank over specially made cutter held in the tailstock. Cutting depth is $\frac{1}{4}$ ".



COMPLETED ROTOR has 24 equally spaced blades around its edge. The curved cut in the jig was made by the cutter at the same time it shaped the blades. Note how the cut continues into the rotor blank to form the curve in the blades.



TURBINE HOUSING is machined from a $2\frac{1}{2}$ " disk of $\frac{1}{2}$ " brass (or it can be turned from $2\frac{1}{2}$ "-diameter rod). Solder the threaded sleeve for the valve over the steam-inlet hole as shown. Fitting for $3/16$ " exhaust tube is already in place.



HOUSING MUST FIT CLOSELY over the rotor, yet provide clearance so it can turn freely. After locating its position, clamp it to the brass plate and drill holes through the flange for the pilot pin and a half-dozen No. 3-48 mounting screws.

ly feed it into the blank until the cut is $\frac{1}{4}$ " deep, noting the depth on the ram calibrations. Note also the position of the tailstock handwheel for precise control of depth.

Loosen the locknut and rotate the blank until the next hole drops on the indexing pin. Repeat the operation until all 24 blades are cut. Remove the rotor from the jig and wire-brush it lightly to

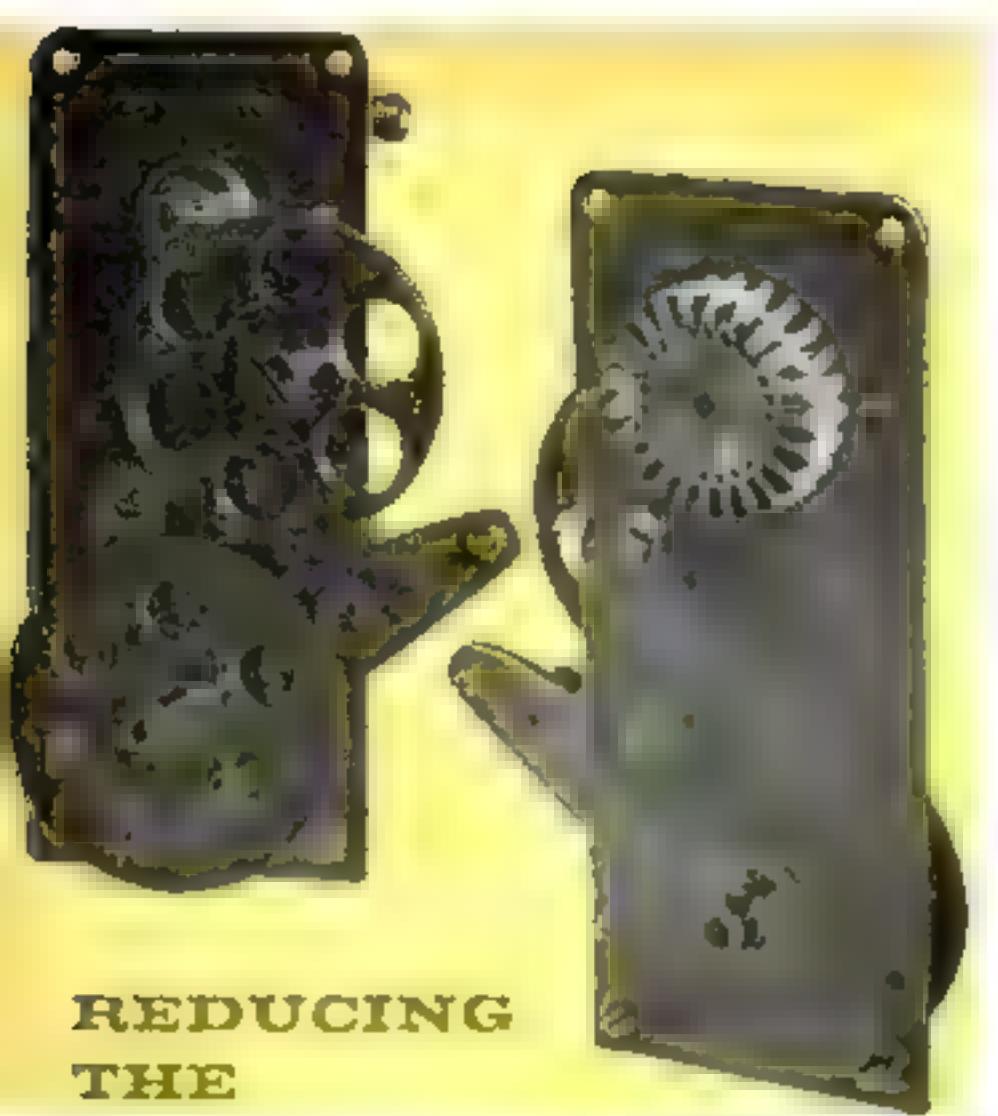
CONTINUED

**Don't go in
for machining?**

**Buy the Parts
You Need**

You can buy any or all of the parts required for the Savannah's steam-turbine power plant, including the complete assembly, boiler and all, ready to connect to the prop shaft of your model. For information, write to Floyd McGuckin, 314 North Monroe St., Ridgewood, N. J.



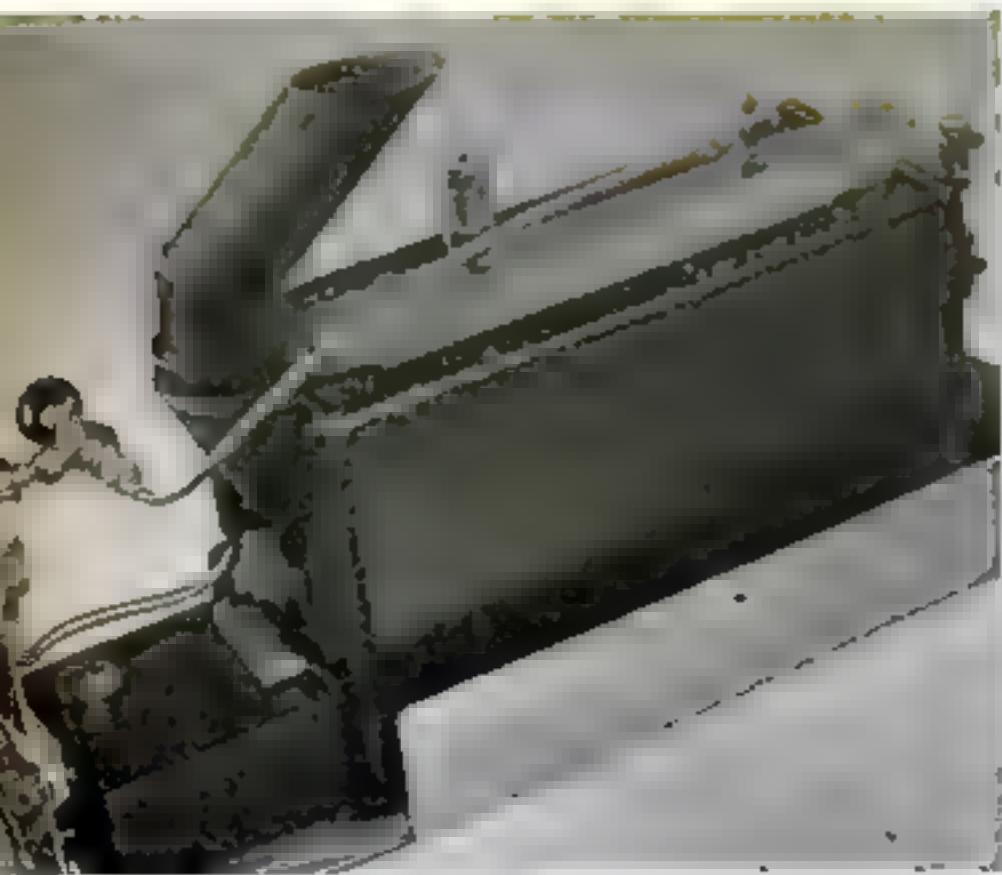


REDUCING THE TURBINE'S SPEED

GEARS TAME THE TURBINE. Several combinations of prop pitch and shaft speed were tried before the little Savannah cut a scale-size bow wave. The gearing shown did the job, reducing turbine speed 6 to 1 to turn the prop shaft at about 1000 r.p.m. The pivoted idler plate, shown in reverse position above, is moved upward to engage the other two small gears for forward motion. The turbine rotor, located at the back of the gear plate, is shown at right.

ASSEMBLING THE POWER PLANT

STEAM IS PIPED from boiler to globe valve on the turbine. Aluminum tray supports the boiler, alcohol tank, and gear train. Boiler is an English-made Stuart-Turner, Model 500, priced at \$18 with burner, water-level gauge, and globe valve. Pressure gauge is extra at \$5.50.



deburr the blades. Press a $1\frac{1}{4}$ " length of $\frac{1}{8}$ " drill rod in the center hole.

Machine the rotor housing from a $2\frac{1}{2}$ " disk of brass $\frac{1}{2}$ " thick. Make the housing recess, exactly as deep as the thickness of the rotor. A thin cardboard gasket between the rotor housing and the gear plate will provide clearance for the rotor and keep steam from leaking out.

The steam-inlet orifice must be drilled at an angle of 20 degrees for maximum thrust against the turbine blades. You can keep the bit from slipping by first drilling a shallow $\frac{3}{16}$ " hole about $1/64$ " deep at right angles to the housing surface. Then clamp the housing at the 20-degree angle and drill into the side of the shallow hole with a No. 60 drill.

Making the gear-reduction unit is simply a matter of laying out the specified gears and drilling holes in the plate for their shaft screws. All of the gear numbers given on the drawing are available from the Boston Gear Works at 14 Hayward St., Boston.

For minimum friction, the gears should mesh easily—even have a slight lash when rotated back and forth against each other. Only the high-speed turbine shaft requires a bearing. This is made by pressing two $\frac{1}{8}$ " Oilite bushings into a sleeve soldered to the gear plate.

Connect the output fitting on the boiler to the globe valve on the turbine inlet with $\frac{1}{16}$ " copper tubing. Run a short length of tubing from the turbine exhaust to the exhaust hole at the bottom of the boiler stack. With this arrangement, exhaust steam goes up the stack with the heat from the alcohol burner.

A bench test of the power plant comes next. This is the big moment. Pour water into the boiler until it is two-thirds full, and fill the tank of the burner tube with alcohol. A sardine can or shallow tray bent from aluminum is handy for firing up the burner. Pour a thimbleful of alcohol into the tray beneath the wick tube and light it. The brief flame will heat the tube and vaporize the alcohol, which will then burn until the fuel is gone.

In five minutes, you should see 50 pounds of steam on the gauge. Open the globe valve to admit steam to the turbine. The rotor should pick up speed rapidly, the high-pitched turbine whine rising in proportion to speed.

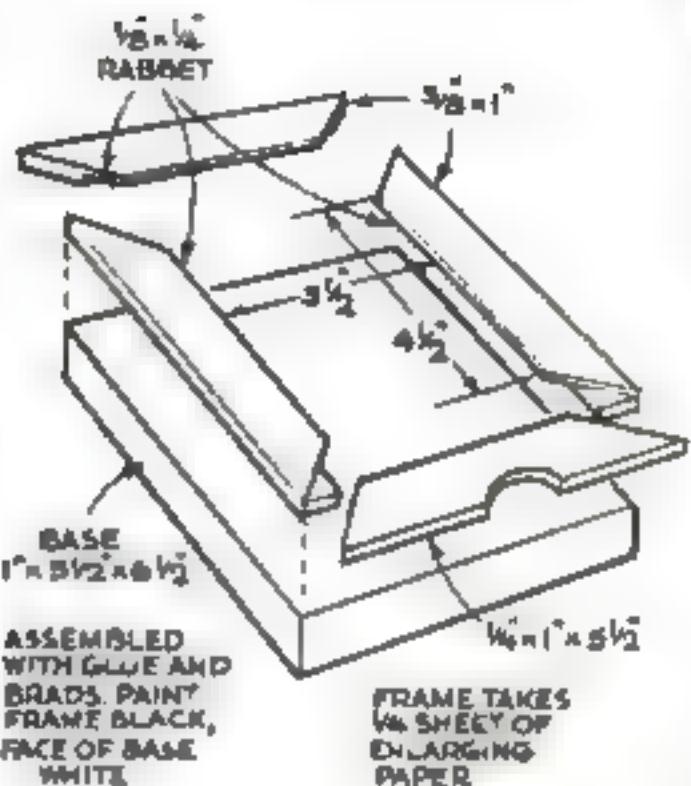
[Continued on page 192]



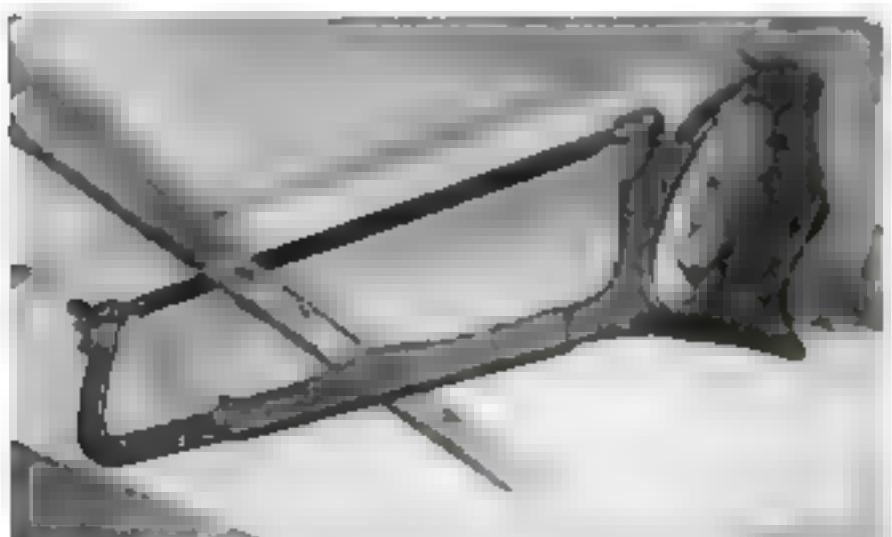
Saves Enlarger Adjustment

To JUDGE whether a small negative is worth blowing up, make a half-size enlargement first. Printed on projection paper, a 4-by-5 proof tells you what an 8-by-10 will look like. With this auxiliary platform and printing frame, your enlarger is set to make either, without ad-

**Short Cuts
and Tips**
FROM OUR READERS



justment, and your easel can be kept set for 8-by-10 prints. The platform is a plywood box. To determine its height, focus a negative for an 8-by-10 image and measure the distance from lens to easel. Lower the head, refocus for a 4-by-5, and measure again. The difference is the height of the proofing platform.—Jackson Hand, Westport, Conn.



You could, of course, saw upwards from below. But that's difficult and tiring with a hacksaw.

Instead, remove the blade and reassemble the saw around the pipe with the

What Would You Do?

...if you had to saw off a pipe or rod overhead, near the ceiling

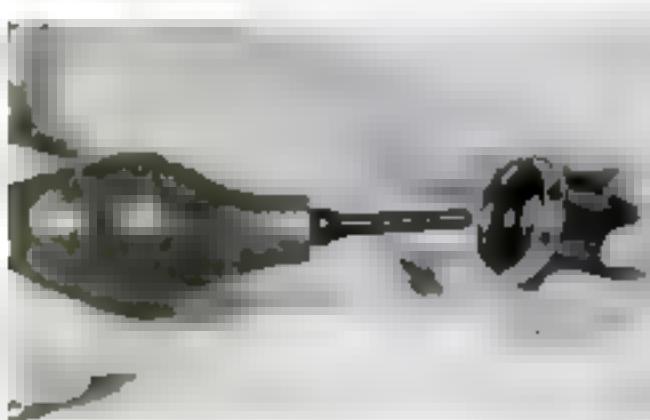
teeth downward—if there's room above the pipe or rod for the blade. That way gravity will work for you, not against you, as you make the cut.

Darrell Huff, Pacific Grove, Calif.

Gadgets Any Photographer Can Afford



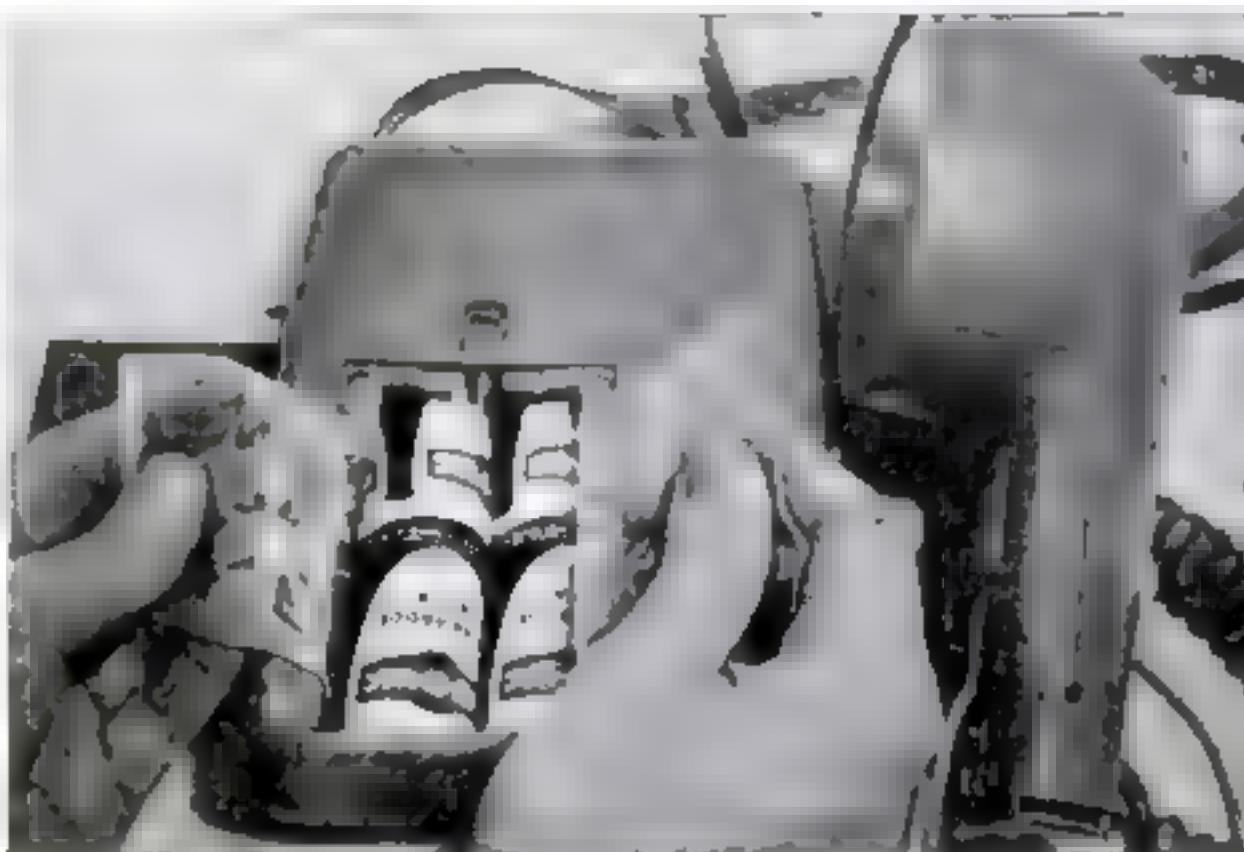
LEVELING DEVICE prevents distortion and tipping in critical setups, yet few cameras have one. A carpenter's line level is small, light, and rugged enough to carry anywhere.



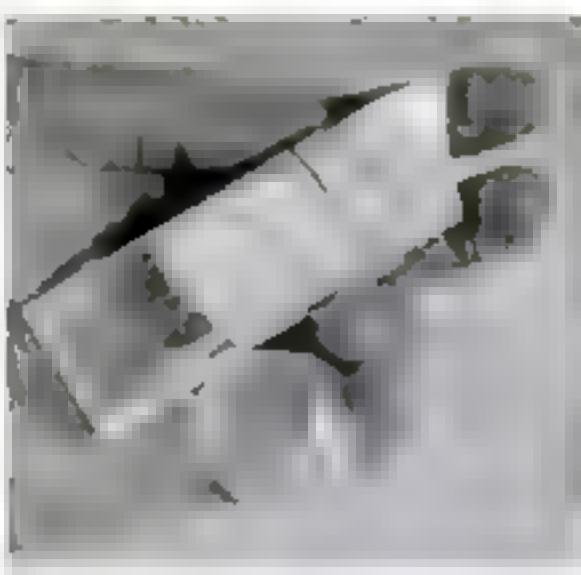
SMALL BULB SYRINGE can be used to blow dust from lenses and hard-to-clean corners inside cameras. Keep it handy, too, by your contact printer or enlarger, for dusting negatives.



TINY DISPENSER BOTTLE, of the kind you get at drugstores nowadays to apply eye or nose drops, will plink out a single drop of lens-cleaning fluid right where it's needed.



PLASTIC BAG, folded into a strip, eases removal of batteries from the compartment of a flash unit. Lay strip across compartment, fold the ends over, and close the case.



PLASTIC PILL BOTTLE with a tight-fitting cap keeps lens tissue clean and dry in your gadget bag. Because it's plastic, there's no danger of broken glass or corroding metal.



CORD SHOELACE with knots tied in it at the most used picture-taking distances makes a tape measure unnecessary for portrait-lens work. Tie to shoulder-strap lug and use it as below.



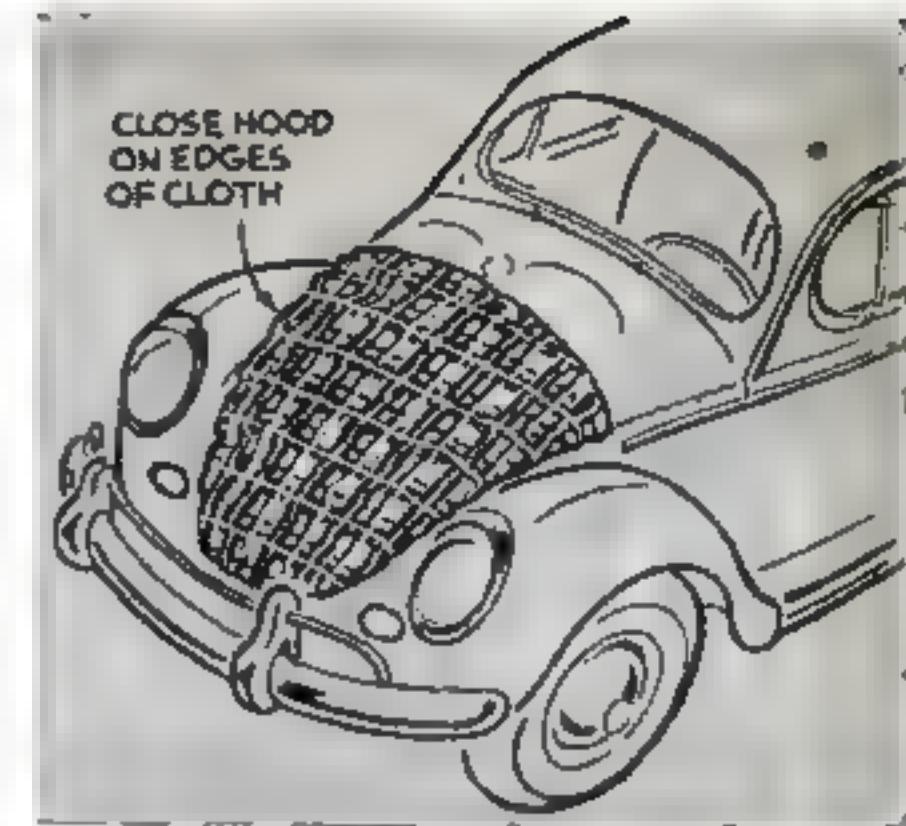
CALIBRATED MEDICINE DROPPER is an accurate dispenser for adding film-wetting agent to the final wash water in your developing tank. Use 0.8 cc. of agent for each 3 oz. of water.



LIGHTER FLUID cleans grit and old adhesive from the felt of a used 35-mm. cartridge so you can reload with bulk film. Remove both ends, spread the casing gently to open the lips.

IMMERSION COIL (intended for travelers who want to heat up a drink in a hotel room) will quickly warm a photographic solution to the specified darkroom temperature.

By
Joseph R. Noonan



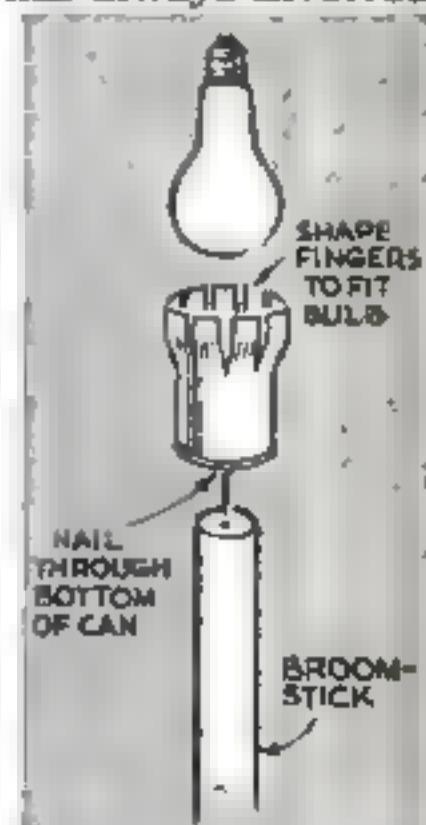
Hood Cover Protects Paint

THE sloping snouts of grille-less European cars are vulnerable to stones kicked up by passing traffic. When you drive gravel roads, keep the finish from getting pock-marked by tucking an old blanket around the lower part of the hood.—*Torsten Gustafson, Malilla-Kyrkby, Sweden.*

►►WHEN reclaiming used bricks, you can remove the dried mortar more easily if you pile the bricks, wet them with a hose, and let them stand overnight. Moisture penetrates and softens the mortar, so it can be removed with less damage to the bricks. Wetting also eliminates most of the dust that usually goes with mortar chipping.—*M. R. Beasley, Detroit.*

Replacing Out-of-Reach Bulbs

PUTTING a new light bulb in the ceiling socket of our garage has always involved a balancing act. The stepladder isn't quite tall enough. Now, however, I have a long-reach gripper. I snipped a series of 2" cuts down from the rim of a can, and bent the strips to the shape of the bulb, making sure they kept their spring tension. These fingers unscrewed the old bulb, put in the new one.—*Mrs. A. M. Nichols, Azilda, Ont.*



Short Cuts and Tips

FROM PS READERS

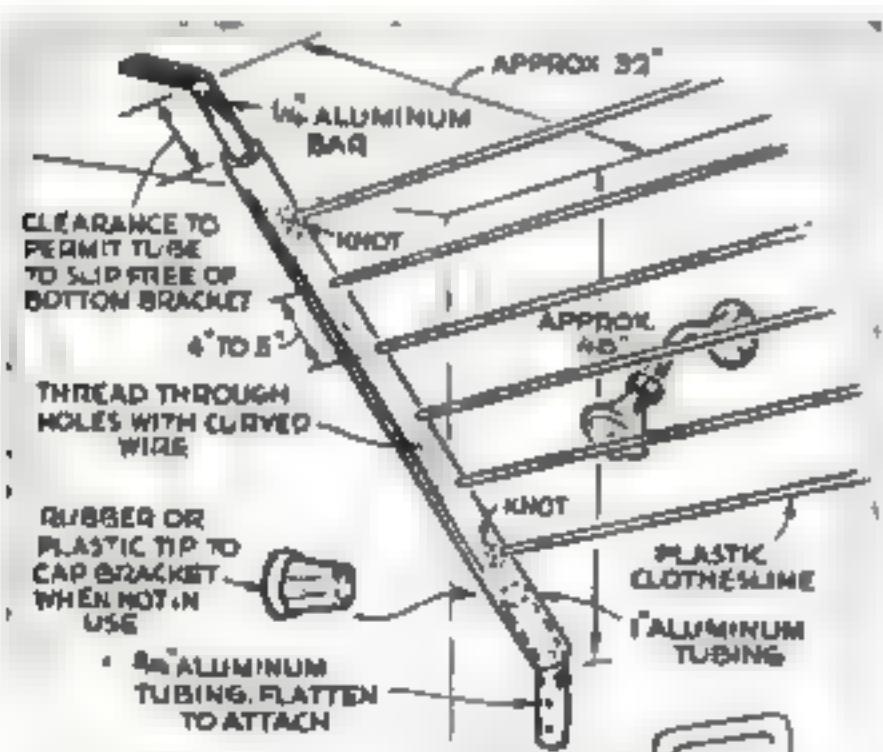


Tire Serves as a Spring

THE utility trailer I just built has an unusual feature: air suspension. A truck-tire tube inside a rimless auto-tire casing supports the body of the trailer. It rests

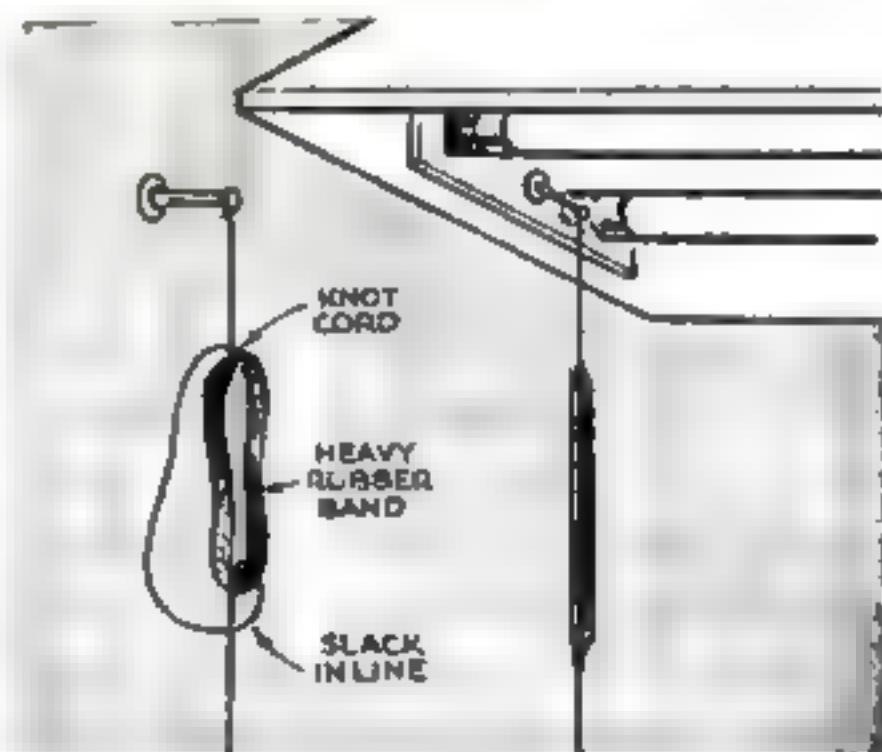
on a plywood frame above the axle. Very little air pressure is required, and it can be varied for different loads. A pair of shock absorbers provide the necessary snubbing action for a smooth, stable ride.

—Ken Boyea, Springfield, Mass.



Removable Drying Rack

THE space over the tub is ideal for an indoor clothesline. This rack—two tubes with line strung between them—bridges a ceiling corner. The tubes slip onto permanent brackets that protrude from wall and ceiling. When the rack's not up, the wall brackets double as safety grips.—J. E. Russo, Portsmouth, Va.



Pull-Cord Shock Absorber

SUDEN jerks often snap the pull cord on a ceiling light fixture. I got tired of dragging a step ladder all over the plant where I'm a maintenance mechanic. I have cut down on breakage by splicing a rubber band into each cord. It cushions the shock and works the switch smoothly.—Robert B. Ryan, Torrance, Calif.

know-how file

How to Live Better with Steam Heat

A HOME steam-heating system works, in some ways, like the system kids use to divide one soda—"three straws, please." The cooperative system works fine unless one of the youngsters has considerably more—or less—"draw power" than the others.

A steam-heating system has "draw-power" problems, too.

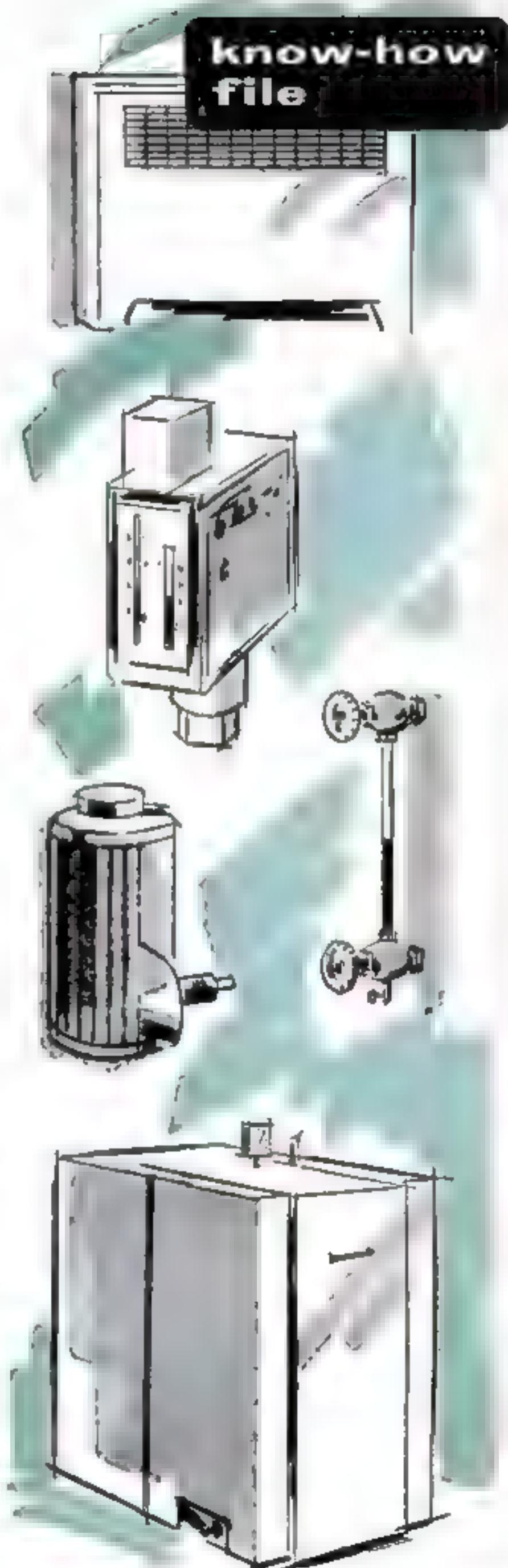
Each radiator draws steam from one central boiler. Each must compete for its full share of steam, but the cards are stacked in favor of some. Unless measures are taken to equalize an unequal competition, some rooms will be too hot—others too cold.

Some of the symptoms of draw-power problems are:

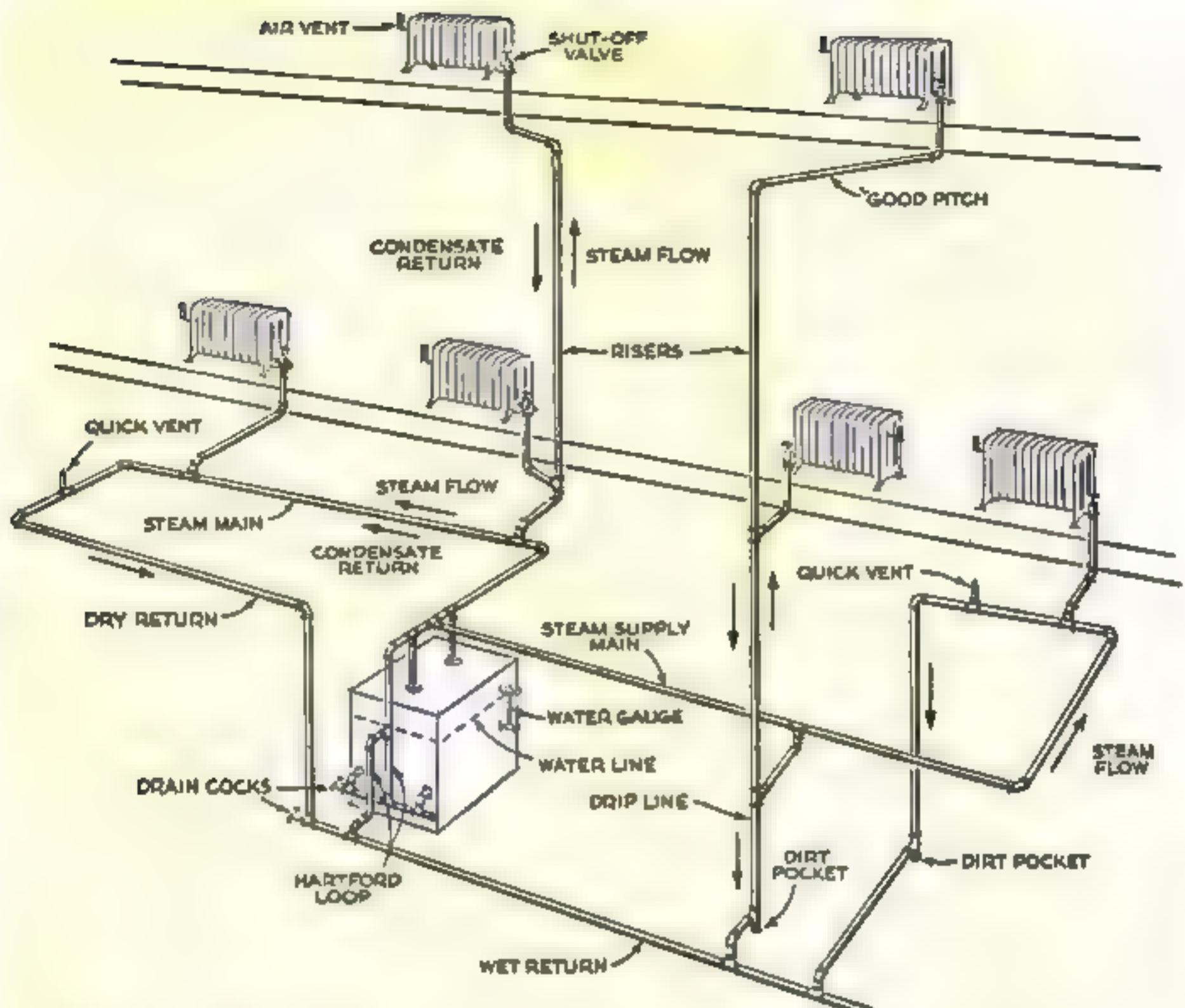
- Chronically cold radiators.
- Radiators with only a few sections that heat.
- Top-heating radiators.
- Radiators that are steam gluttons.

On the following pages, in words and pictures, you'll find solutions to many problems, along with tips to save you money and improve your comfort. You'll also find a "how it works" description of a standard steam-heating system that may also help you get the most out of your heating plant.

After you have each radiator working at peak efficiency, turn to the Five-Step Balancing Program.



CONTINUED



HOW IT WORKS

THE usual home steam-heating plant is a low-pressure, one-pipe system—i.e. the operating steam pressure is between zero and 15 p.s.i., and steam and condensate flow through the same pipe. When cold, the mains, risers, and radiators are filled with air.

When the fire comes on and the steam pressure rises, the steam moves through the pipes toward the radiators, pushing the air ahead of it. Thermostatic vent valves on each radiator allow the air to escape so that steam can fill the radiator. When steam reaches the valve, a thermostatic spring or bellows closes to prevent loss

of steam. When the valve cools, it opens and allows air to flow back into the system again.

A similar installation called a vapor, or vapor-vacuum system, differs in one important respect: The vent valve does not readmit air to the system. Operating pressure is generally lower and may sometimes be below atmospheric pressure. The advantage is mainly in maintaining a more uniform temperature throughout the system. But it must be designed and maintained completely airtight to be effective.

In either case, the steam gives up its heat to the radiator and in so doing

13 steps toward getting more heat for your money

condenses into water. This makes room for fresh, hot steam to enter the radiator. The condensate flows by gravity back through the single pipe toward the boiler. Somewhere back along the line, the liquid separates from the dry steam line, flows into the wet return and re-enters the boiler below the water line. To expedite the return flow, there may be a pipe, called a drip line, connected to the point where a branch line leads off the main. It drops straight down to the cellar floor and runs along the floor to the wet return.

The *shut-off valve* at each radiator is there for only one purpose: to remove the individual radiator from the heating circuit. It should always be turned all the way on, or shut off tight. Not only is it ineffective in modulating the amount of heat, but operation with the valve partly closed may cause the radiator to fill with water and allow loss of steam around the valve stem.

Ideally, no boiler water is lost in the heating cycle. You keep using the same water over and over. In practice, there will always be a slight loss even in the best systems and you have to add boiler make-up water from time to time. Most home owners know the dangers of operating with the water level too low, but many are not aware that too much water can seriously restrict the steaming capacity of the boiler. If there is no water line marked on the boiler, a good rule of thumb is to keep the water-gauge glass between one-third and one-half full.

Steam leaking from anywhere in the system can cause a boiler to be chronically "thirsty." Faulty radiator vent valves and leaky packing around the stems of individual radiator shut-off valves are frequent offenders. Water leaks in a return line buried in the cellar floor, or pinhole leaks in an operating boiler, are possible causes for mysteriously high make-up water demands. In the latter case, tiny streams of water may spurt from the boiler when it's operating and be immediately evaporated by the heat—leaving no telltale signs.



1 *Insulation pays off* in fuel savings and comfort, even if it is only a few square feet directly behind radiators. The walls behind a radiator may reach a temperature of 100 degrees or more on the inside. Because of the considerable temperature difference between the inside and outside of the wall, heat flows out at a rapid clip and is wasted. Rate of outward heat flow is proportional to temperature difference.

2 *Vent valves should be properly seated, upright and tight.* If water collects in the valve, unscrew it, shake out the water.



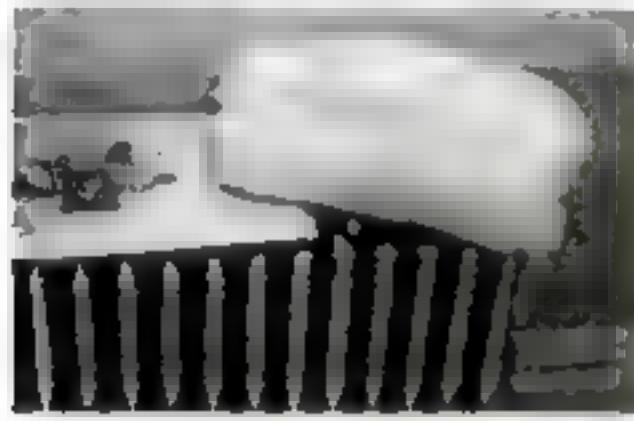
3 *A top-heating or short-circuiting radiator is not carrying its share of the heating load.* Steam entering these units flows across the top and causes the vent valve to close before the entire radiator is filled with steam. A cure that often works is to remove the top radiator plug and insert a piece of pipe the length of the radiator. The pipe should be as large as will fit in the hole and should be closed at both ends. Replace the plug. The pipe helps force the steam to circulate before it reaches the vent valve.



4 Radiators should tilt toward the end with the hand shut-off valve. If the radiator is level or pitched the wrong way, water will collect in it and partially or completely block incoming steam. Check with a level, and shim up the radiator feet to get a definite pitch.

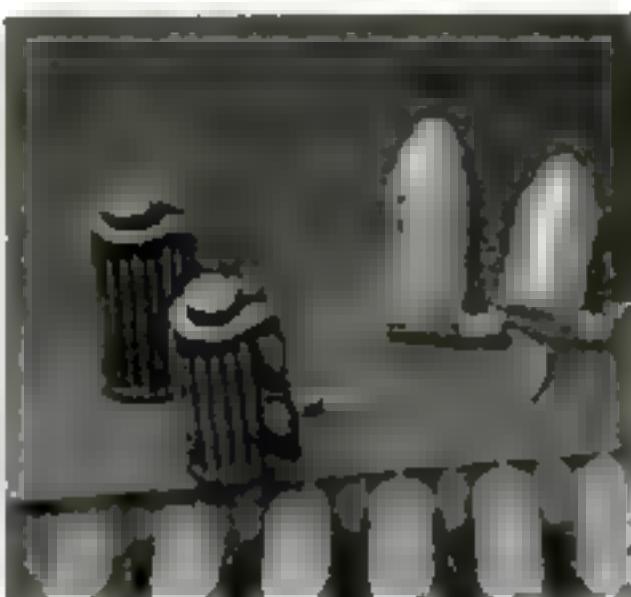


5 Keep radiators clean of dirt, dust, and household fuzz. They restrict heat transfer and circulation of warmed air.



6 Do not obstruct radiators; odds and ends stacked on a radiator, or furniture in front of it, block, absorb, or divert heat from the rest of the room. Be sure any enclosure around a radiator is designed to promote air circulation through the radiator. There should be an adequate opening at the bottom to admit cool air

and another at the top of the front face to allow warm air to flow out into the room. It is especially important that the wall behind enclosed radiators be well insulated.



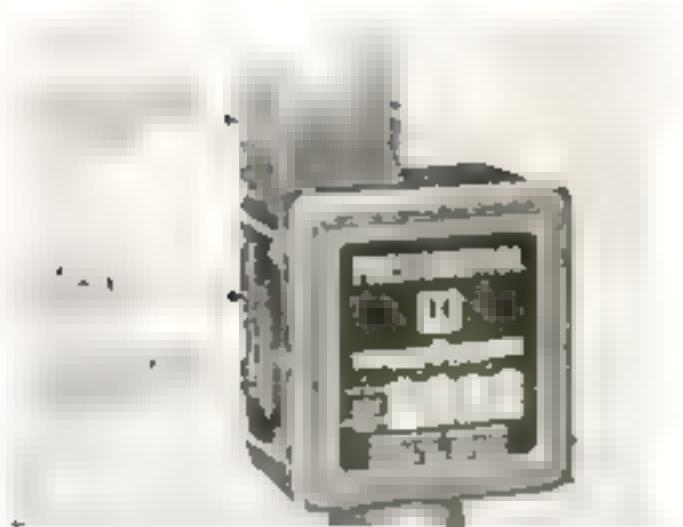
7 Obstructed vent-valve holes, plugged or painted over, will keep a radiator from heating properly. The same brand and kind of vent valve is preferable on all radiators in a system.



8 Use automatic, adjustable vent valves if your boiler is automatically fired. Fixed vent valves are suitable for coal-fired furnaces that maintain a long, steady heating cycle. But if you convert to oil or gas, you should switch to the quick-venting, adjustable valves.

9 Stubborn radiators that won't heat properly can often be helped by multiple vents. If adjusting the vent to the fastest rate still leaves a radiator cold when the rest of the system has been heat satisfied, drill and tap for extra vents.





10 *Insulate steam mains and risers* because bare pipes carrying steam from the boiler to the radiator waste heat. They also slow the response of your radiators when heat is called for.

11 *Install quick vents* in the steam mains in the cellar. These quickly purge air from the supply lines and allow steam to reach radiators with less delay.

12 *Have limit control adjusted* to avoid excessively short, frequent firing cycles. There are two adjustments: main scale and differential. The control shuts

the fire off when boiler pressure equals main-scale setting plus the differential. The fire can come back on when pressure drops to the main-scale reading, if the thermostat upstairs is still calling for more heat.

13 *Low, narrow radiators* do more heating than tall wide ones. Two smaller ones are generally more effective than one big one. Radiators along an outside wall, preferably under a window, will make a room more comfortable than the same area of radiation placed along an inside wall.

How to balance your steam-heating system

When you have solved individual radiator problems, you are ready to balance the entire system. Here are the steps:

1. Choose a day when low outside temperatures will allow the system to operate without overheating your house. Begin from a cold-radiator start. Push the thermostat up high enough to require continuous boiler operation.

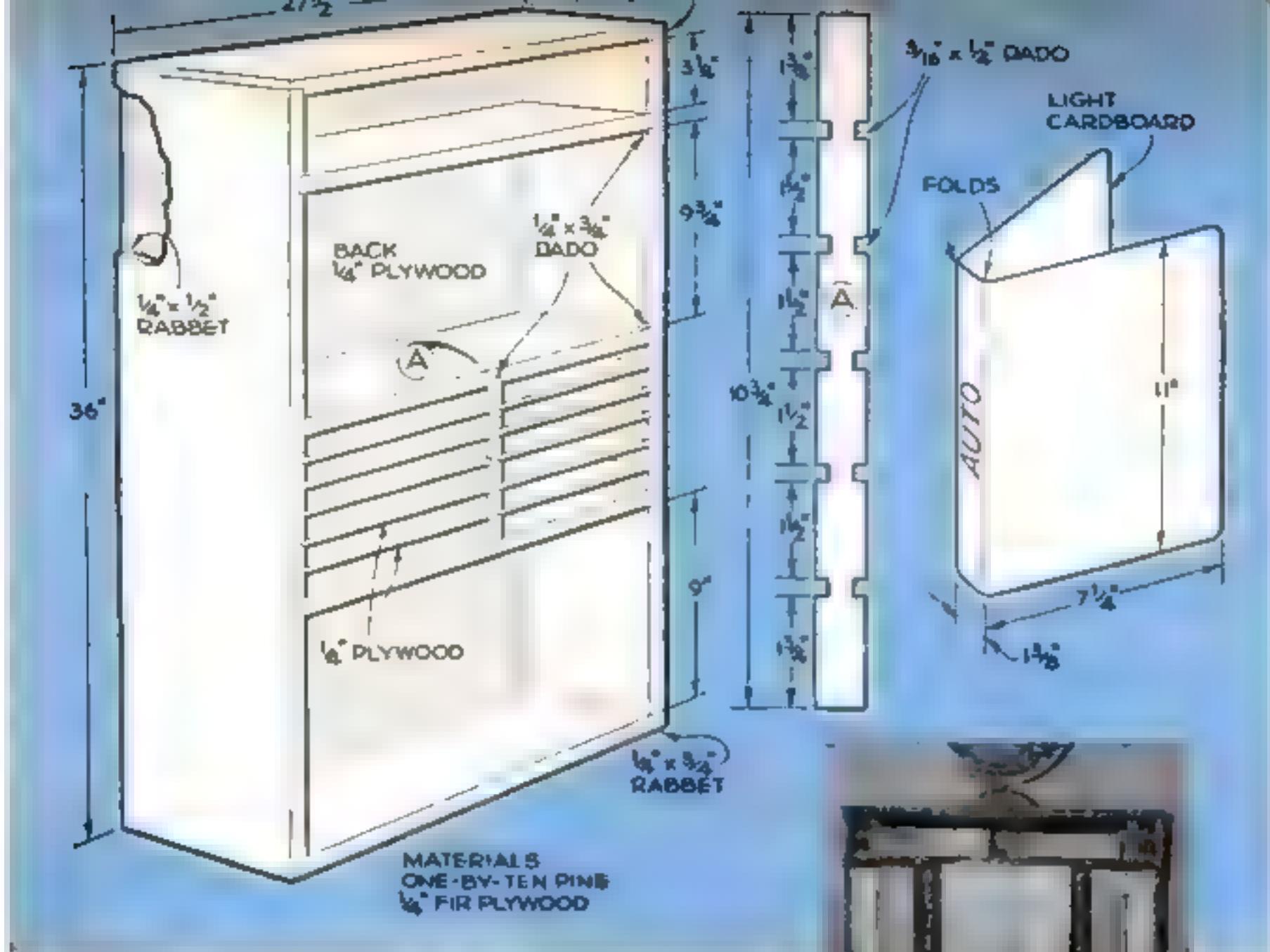
2. After 15 to 30 minutes, check all radiators for the number of sections that are warm up to this point. Only the first section or two may be warm on some. Some may still be completely cold, others uniformly hot.

3. To begin adjustment program, regulate vents by turning or screwing the adjustment knob. For radi-

ators heating faster than average, close down one notch; for those heating slower than average, open up a notch.

4. Rerun test several times until all radiators heat uniformly.

5. If certain radiators are still too slow to heat, they are probably far from the boiler. Check the steam mains to be sure there is a quick vent near the end. If there is one and it is working okay, you can still help by double or triple vents in the cold radiators. If there is no quick vent in the main, have one installed. You will then need to re-balance the whole system.



Rack for Storing Popular Science Articles

DO YOU have a growing pile of magazines, POPULAR SCIENCE and others, that you hate to throw out? To store mine, I built the cabinet you see here. On the top shelf I keep the latest 12 or so issues for future browsing. Below, in a series of labeled folders, I store valuable articles removed from older magazines, all indexed so they can be found without fuss or bother.

After building the storage rack and making a batch of folders, here's how you can tackle your own pile of magazines:

First put aside those for the browsing shelf. Then select the newest issue in the discard pile, remove the staples, and pick out the material to be saved. Staple the separate articles and file them in the appropriate folder. By starting with the newest issue, you get up-to-date material and often won't have to bother with a lot

of older articles on the same subject.

On the second shelf you have space for two midget file boxes—3" by 8" by 9 1/2"—for storing your POPULAR SCIENCE Reference Library inserts and any other small booklets. On the bottom shelf I store the best of my hobby magazines. To cut indexing to a minimum I use a code to note the location of the articles, such as "PS 260-13," which means POPULAR SCIENCE, February 1960, page 13.

It's a lot of fun going through your magazines again with a definite purpose. You will run across many items that you never saw before or paid little attention to. You will condense that huge pile to a reasonable size and you'll be able to find what you're looking for. Without the system, the pile is good only for browsing—you'll never be able to find a particular article.—*Julius Thauer, Pittsburgh*.



Facts About the New PSTs*

materials
file



***Pressure-sensitive tapes are worth knowing about. Plastic, nylon, cloth, paper, metal —you name it, they've made a tape of it**

IN HOME and shop nowadays, pressure-sensitive tapes are just about indispensable. They're ready to lend you a hand with countless woodworking, painting, decorating, repair, and handicraft jobs. They stick like glue, can be stronger than rope, and at times make an acceptable substitute for paint.

You can classify modern tapes in five categories depending on the backing used in their manufacture—paper, film (including the plastics), cloth, filament, and metal. Most of them have a rubber base adhesive that clamps a firm grip on anything the tape touches. But don't judge a tape's sticking strength by how sticky it feels to the touch. Some that feel barely tacky have tremendous holding power. Some that feel very sticky will not hang on half so well.

The tapes are available in widths from $1\frac{1}{2}$ " up to 4", and are made in a spectrum of colors. Some types, such as the plastics,



PAINTING A BOAT? REPAIRING A CORD? These are just two of the many common jobs where you'll find it convenient to use a modern tape.



PROTECT A CHROME PART such as this sink faucet with a cushion of masking tape before you tackle it with a wrench. Make the cushion thick enough so the wrench won't bite through.

SCHOOL INITIALS on a briefcase, in the school's colors, are no trick at all when you choose and use modern plastic tape in colors.



ON THE LEVEL, cloth sewing tape does duty as a ruler. It can be held firmly and invisibly in place with any clear plastic tape.

ON MOVING DAY, use masking tape to secure drawers and cabinet doors while the household goods are in transit to the new home.



BOAT BUMPER NEED REPAIR? For this job use a black plastic tape. The tape is strong and waterproof, will stand up under hard wear, and, like other PSTs, will stick at a touch.

are waterproof; others have a tensile strength ranging up to an amazing 500 pounds for one of the inch-wide (and $1/100$ " thick) glass-fiber filament tapes. Although a tape usually is made for a specific purpose, most will do a variety of jobs.

Paper tapes. Masking tape is the king in this category. Made with a somewhat crinkly crepe-paper back, it is produced in widths from $1/4$ " up to 3". The crepe-paper back allows for stretch and makes the tape easy to tear. Most masking tape has a moderate tensile strength, around 20 pounds per inch width. Standard color is a natural tan.

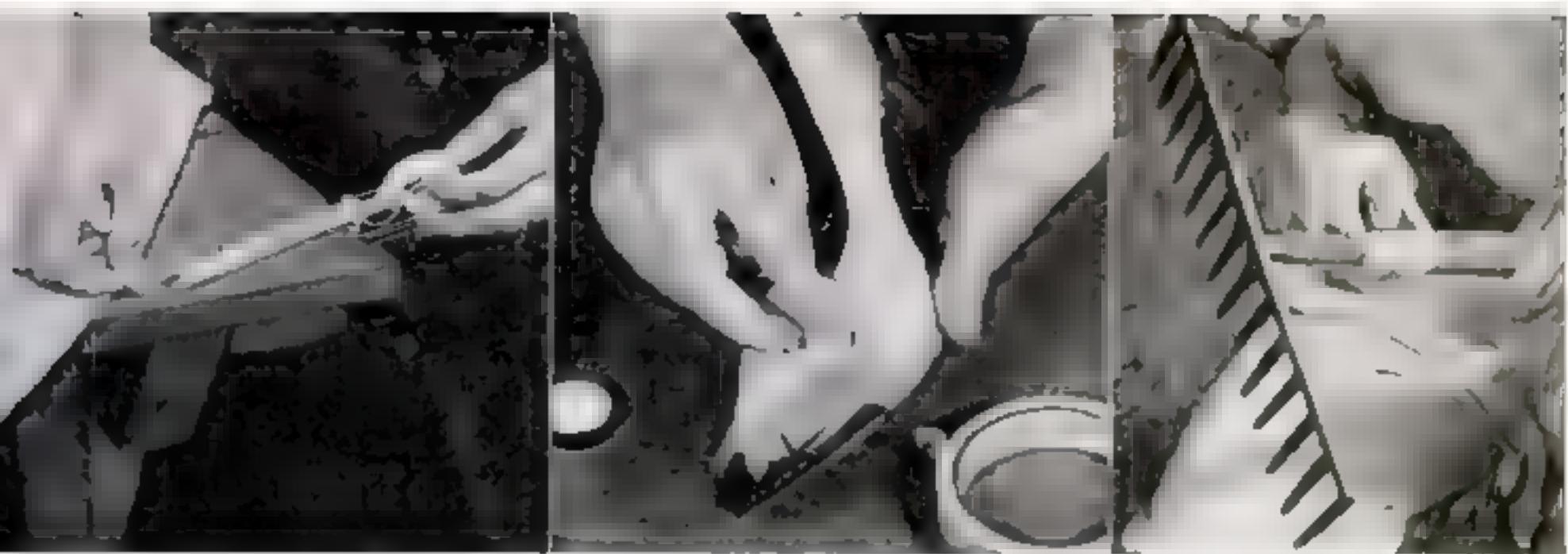
The uses of masking tape are almost endless. Its primary function, from which it derives its name, is to produce a clean edge when you are painting.

Masking tape may also be used to clamp glued parts together, to seal the backs of picture frames, to bind wood parts being sawed, to mend fabrics and materials, to wrap rough or broken tool handles, to hold patterns in place, and to hold drawers shut when you move furniture.

High-temperature masking tape is available for paint jobs that have to be baked.

Closely allied to masking tape are flat-back paper tape, with less stretch and more strength; drafting tape, which will not harm cloth or paper; freezer tape, which sticks tight at low temperatures; and black paper tape, a boon to photographers and dark-room technicians.

Unique among the paper varieties is



ON A WINDY DAY, double-face tape is the thing to reach for to hold down a picnic tablecloth. Use it on paper plates, too.

FOR A TWO-TONE SHINE, use masking tape on shoes to keep the colors from overlapping. The tape will pull away easily.

CRACKED RAKE HANDLE can be reinforced with tape. Mending and grip-reinforcing tool handles are two useful tape jobs.

double-face tape. Coated with adhesive on both sides, this is perfect for mounting snapshots in albums, for making a dark-room easel for photo enlargements, for attaching felt pads to lamp bases, for pasting down art layouts, for holding shelf paper and decorations in place, and for invisible gift wrapping.

A wide (up to 3") paper-carton sealing tape has recently been developed to replace the old wrapping tapes, which must be moistened.

Film tapes. Varicolored, strong, and usually waterproof, these include the well-known cellophane tapes and others that have a backing of plastic cellulose acetate, vinyl, polyethylene, and nylon. They are made in widths ranging from $\frac{1}{4}$ " to 4", and in such colors as yellow, brown, green, red, blue, white, and black. There are also transparent varieties.

A top performer is black vinyl electrical tape made in $\frac{1}{2}$ " and $\frac{3}{4}$ " widths. Its superior qualities have made it the successor to rubber and friction tapes for many kinds of electrical work. You can also use it to insulate tool handles, to patch pipes not under pressure, and to mend garden hose.

Cellophane tape is probably the best known of all PSTs. Like masking tape, it's almost an all-purpose tape. It is used for a host of mending, sealing, patching, and packaging jobs. Made in widths from $\frac{1}{4}$ " to 1", it also comes in colors, and in this form is tops for gift wrapping.

An ultra-transparent film tape, known as magic mending tape, is practically invisible when used to cover tears in

paper. You can write on it with a pen or a pencil.

There is also a double-face cellophane tape.

Colored plastic tapes are made in widths from $\frac{1}{4}$ " to 4" and are invaluable to the handyman and the amateur decorator. Use them to repair plastic garden hose, inflatable plastic toys, auto-seat covers, shower curtains, table cloths, rain-coats, boots and galoshes, umbrellas, and schoolbook binders.

A new nylon-backed "sliding tape," $\frac{3}{8}$ " wide and slightly thicker than other plastic tapes, is intended to reduce friction when used as a runner on drawer bottoms.

Cloth tapes. Made in practically any width and color you might desire, these tapes have enormous decorative and handicraft possibilities and may also be used for many mending jobs. Some have a plastic coating and are said to be waterproof.

Cloth tape is a good substitute for paint in certain situations—where you want to add color to shelf edges, for instance, or stripe small pieces of furniture.

Use cloth tape to repair fabrics and upholstery, to cover faded tapes on venetian blinds, to mend lamp shades, window shades, and book bindings, to wrap the handles of sports equipment, to repair canvas, and as an invisible weatherstripping.

Filament tapes are the strong boys among the PSTs. Made with a backing of strands of glass, nylon, or rayon, they have the highest tensile strength of any



PLYWOOD WON'T SPLINTER at the edge so badly if you take the time to put a strip of masking tape where you plan to make a saw cut.



PLAYTIME FOR THE YOUNGER SET: Colorful plastic tape is just the thing. Decorative shapes cut from it will adhere even to glass.



RUBBER GALOSHES can be reinforced and decorated with plastic tape. Moisture resistance is a characteristic of this kind of tape.



A STRIP OF CLOTH TAPE is being used above to decorate a place mat. The cloth tape can be used to repair any torn or scuffed material.

of the tapes—up to 500 pounds per inch of width.

You could, if you were stuck, actually fashion a car tow chain from one of these tapes. It's been done and it works.

Filament tapes are made in widths from $\frac{1}{4}$ " to 3". Colors include red, black, blue, and white, in addition to the standard transparent type. The glass-fiber variety is the strongest and has the least stretch.

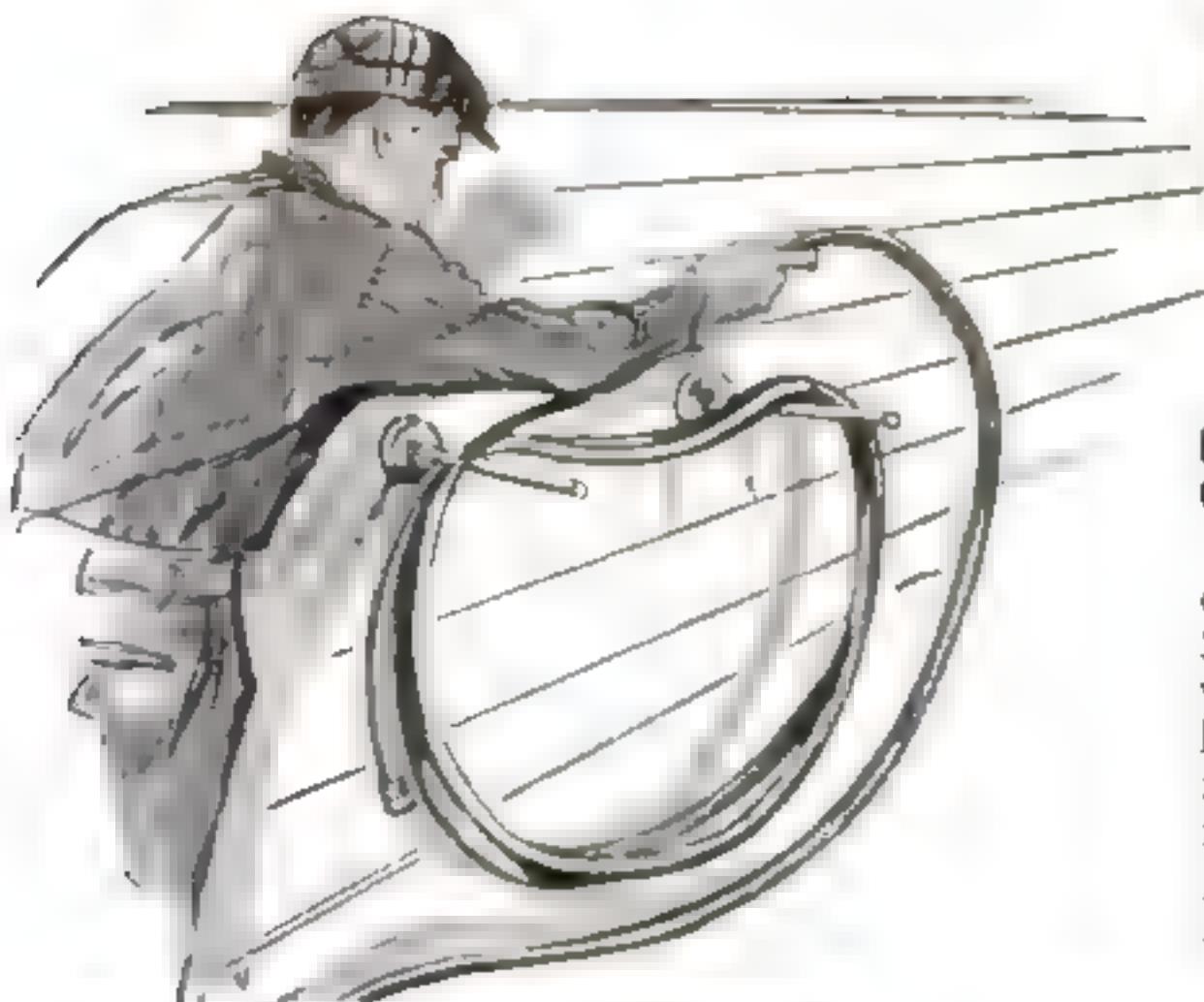
The superb strength of filament tape, sometimes called strap tape, can be harnessed for special jobs around the home and shop. Use it as a heavy-duty glue clamp on odd-shaped objects, to repair broken tool handles and broken furniture, to seal cartons for storage or moving, to bundle up lumber and pipe, and to hold down tarps.

Metal tapes. These special-purpose tapes, much used in industry, are not actually made for the retail trade. If you think nothing else will solve your problem, however, you may be able to wangle a roll through a tape distributor.

Metal tapes are made in two forms, aluminum foil and lead foil, and in $\frac{1}{2}$ " and 1" widths. The unusual composition is the best clue as to how they might serve you. The aluminum-foil tape will join or seal aluminum in any form.

Lead foil, because of its inert status, makes a good bond between unlike metals. Sealing the joints around vent pipes in metal roofs is one of its jobs.

Handicrafters with imagination may be able to achieve unusual decorative effects with it.



**Short Cuts
and Tips**
FROM READER'S
MAIL BOX

Hanger for Garden Hose

MOUNT two 12" lengths of $\frac{1}{2}$ " pipe in flanges about 2' apart on any suitable wall—on the outside of the house or in the garage, for instance—and you have a neat and handy hanger for your garden hose.—F. W. Banner, Morrisville, Pa.

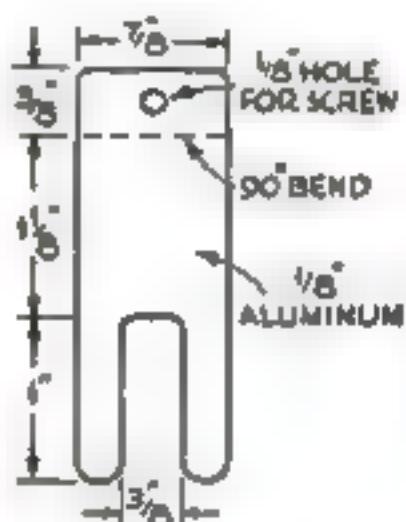


Wax Simplifies Thread Miking

HOLDING three tiny wires against the threads of a screw is a four-handed job when you're trying to measure the diameter with a micrometer. I press the wires into a small can filled with wax, and the wax holds them perfectly. When the wax gets full of holes, I simply remelt it and let it harden again.—H. J. Gerber, Stillwater, Okla.

Antique Finish from Shoe Polish

TO OBTAIN an antique finish on wood carvings, ordinary shoe polish gives beautiful results. The best colors to use are oxblood and mahogany stain. Rub the polish into the pores with one cloth, then with a clean, soft cloth give it a brisk polish.—Martin D. Koehler, River Grove, Ill.



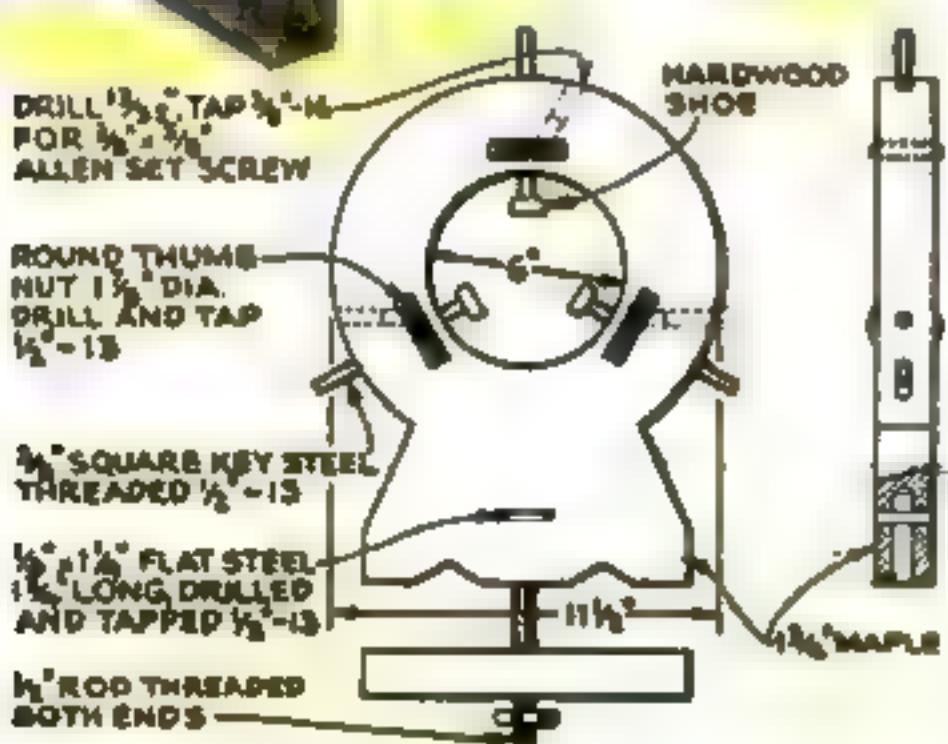
Clip Locks Power Cords

PLUGS on tools, freezers, and other appliances can't accidentally pull loose from wall receptacles with this clip. Cut it from $\frac{1}{8}$ " aluminum, slot one end for the cord, and bend it into a hook to fit over the plug. The screw in the cover plate of the outlet holds the clip on, locking the plug in the socket.—Herbert G. Eidson Jr., Winston-Salem, N. C.





HOW TO MAKE A Steady Rest for a Wood Lathe



A STEADY rest is not a usual accessory for a wood lathe, but the use of one will open up a whole new category of turning projects for you. For instance, you'll be able to turn hollow wood projects, such as flower vases, that are too long to be worked unsupported from the faceplate.

The steady rest shown here can be duplicated for about \$6. It was made to fit a Shopsmith, but the dimensions can be adapted to any wood lathe—or even to a small metal lathe if you wish.

The main body of the rest is made from 1 3/4" maple. The outside shape is cut on a band- or jig-saw. The inside is rough-sawed 1/4" undersize and then bored with the workpiece clamped in place on the lathe. Square holes for the key stock and slots for the thumb nuts are cut with a 3/8" mortising bit. Use talcum powder when tapping wood for setscrews.—H. L. Luckett, San Antonio, Tex.

Short Cuts and Tips

FROM P'S READERS



Whirling a Pen to Make It Write

WHEN a ballpoint pen refuses to write, I whirl it on a string with the point outward. The ink usually is driven to the point.—R. Deen, St. Cloud, Minn.

►►►TO HAUL long pieces of pipe, place them on the ground and straddle with a car. Raise and tie ends to front and rear bumpers

►►►WHEN I go under the hood, I like a clean engine to work on. With a 3" paint-brush, I apply a mixture of three cups of household detergent and four of hot water to the engine, battery, fender, and firewall. Then I rinse with a garden hose. Afterward, I lift the distributor cap and wipe inside with a clean cloth.—M/Sgt. W. L. Rivers, Plattsburgh, N. Y.

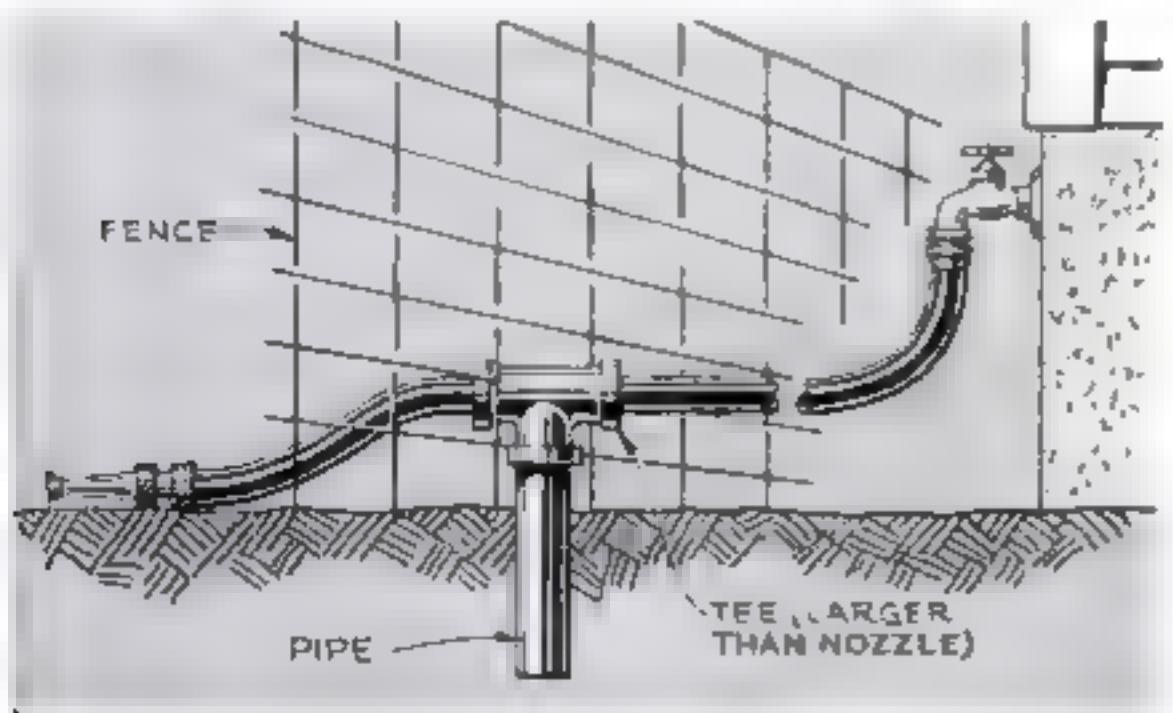
Shelf for a Typing Table

TO GAIN additional storage space, I made a three-sided bin out of $\frac{3}{8}$ " plywood and inserted it in my typing table. By loosening the stretcher bar at the table bottom it was possible to spread the frame slightly and push the bin into place. A few screws hold it securely.—Jerry Parker, Sonoma, Calif.



Tee Protects Garden Hose

A GARDEN hose may become badly worn at a spot where it passes through a woven wire fence, as in my garden. To protect it, I drove a piece of pipe into the ground at the base of the fence and threaded on a tee that's large enough to let the hose nozzle slip through.—W. C. Whittle, Carlinville, Ill.



Good Tricks for Better Power Sanding

By George Daniels

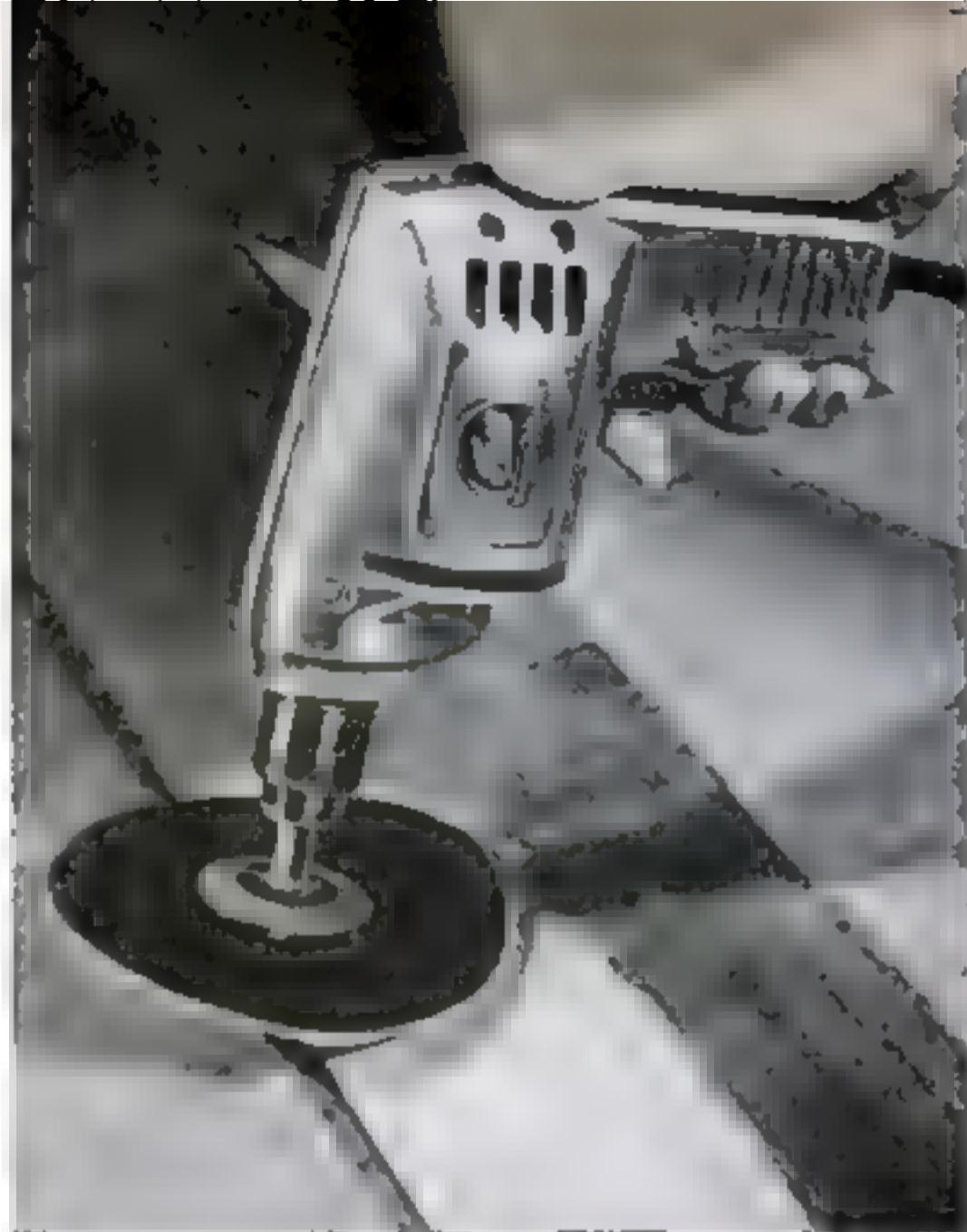
THE rules of power sanders are strict: Rotary sanders cut fast but leave circular marks, so you're not supposed to use them for fine-finish sanding; straight-line sanders cut smoothly but slowly, so you're not supposed to use them for fast, rough work.

You've probably heard these a million times. Yet there are many occasions when you can break the rules if you know the special traits of each type of power sander and the tricks for getting more out of it.

Take a *disk sander*, for instance. It cuts fast and ferociously. A coarse, flexible disk in an electric drill, turning at 2,400 r.p.m., will grind a picket-fence point on a one-by-two in 70 seconds.

But a disk is temperamental. It works too fast for easy control of its cutting depth. It may skip, slip, and gouge capriciously, and its rotary motion leaves

YOU CAN EVEN SMOOTH GLASS with a reciprocating sander used like this. Set it upside down on a rubber pad to absorb vibrations, and tilt the glass slightly to round the edges.



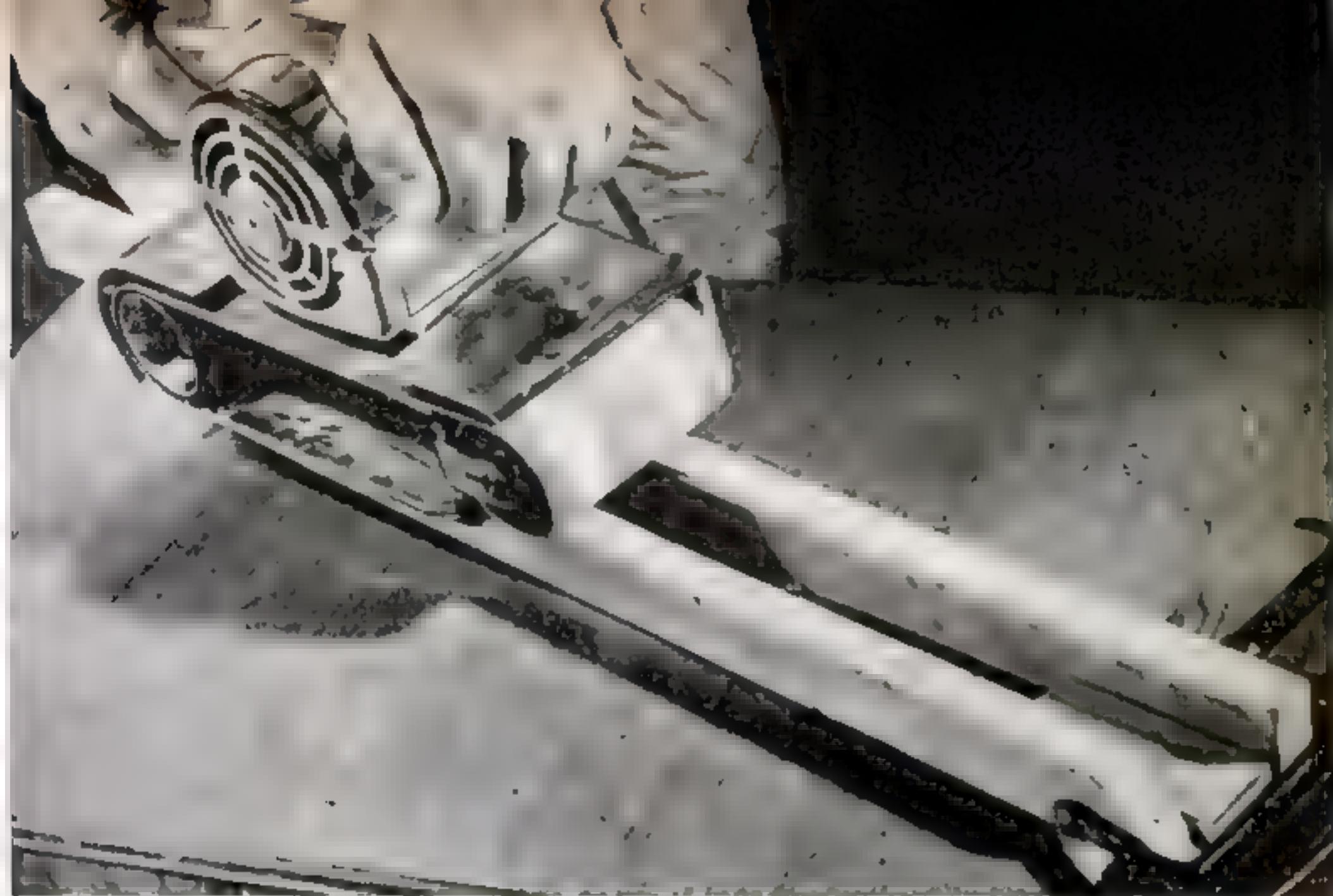
FOR STRAIGHTEST SANDING ACTION from a disk, tilt it so only the outer third touches the work, minimizing swirl marks. Try to develop the one-hand knock shown above. Though awkward at first, it helps you apply smooth, even pressure through a flexible wrist motion.

circular scars. This makes it tops for rough sanding, shaping, and skinning off heavy paint, but not so good for fine finishing. Still, with care, you can overcome its worst objections. There are three tricks to it:

1. Tilt the disk at about a 15-degree angle, so only the outer third touches the work. This way, you get close to straight-

DON'T OVERLOOK YOUR DRILL as an important sanding tool. Besides disks, it will power sanding drums up to 3" in diameter for fast smoothing and shaping of intricate contours.





FOR A SQUARE EDGE on narrow stock when you're using a belt sander, clamp a second strip in place to hold sander level. Belt sanders are top choice for fast, fine finishing.

line cutting action instead of swirls. You also get maximum cutting speed since the outer portion of the disk travels much faster than the center. The faster a sander moves, the smoother it cuts. A 5" disk turning at 2,400 r.p.m. has a rim speed of 3,000 feet a minute. Keep the disk moving in the direction of the grain, never across it, and don't stop in one spot.

A HOMEMADE STAND like this doubles the use of a portable belt sander by turning it into a bench tool. The hose-holding bracket lets you borrow your wife's vacuum cleaner to suck up dust.

2. Don't start with an abrasive grade that's coarser than the surface calls for—this will do more roughing than smoothing. Switch gradually to progressively finer grades, never skipping more than one grit size in the series. This way, each grade smooths away the marks of the preceding one.

3. When you've finished with the finest grade, let muscle power take over. A final touch-up sanding by hand will remove most of the rotary marks.

HIGH-SPEED SANDING in a table saw will cut bevels almost as fast as a router, more smoothly than a saw. This homemade 8" disk cut from 3/4" plywood has two advantages: It costs practically nothing, and you can mount a different grade of abrasive paper on each side.



Workshop Chamber of Horrors: Five examples of sloppy work



SWIRLS ARE UNAVOIDABLE with a disk sander, but needn't be this bad. Dark, broken lines above are hit-and-skip marks made because the disk's rim fluttered under too light pressure.

One caution: It's best not to use a disk to smooth plasterboard seams. Any paper coarse enough not to clog may cut right through the board's thin paper facing before you can stop it.

Ball-joint sanders, a recent development, work differently from regular flexible disks. They have a disk that's rigid but freely pivoted so it always lies flat against the work, even when the drill is tipped.

With only a narrow band along the edge of the disk touching the work, you get high cutting speed. The rotary motion does produce some swirls, but the self-leveling action of the pivot eliminates deep scratches and gouges. The best way to use the disk is with light pressure to keep r.p.m. up, overlapping passes to blend them together. It's fine for preliminary sanding, but not for heavy removal or finishing.

Rigid sanding disks can be mounted on a table saw or on the shaft of a separate motor. The metal backing plates sell for about \$5, or you can make your own from plywood.

These work at such high speeds that they give you a shaping tool as well as a smoother. An 8" disk at 3,000 r.p.m. has a rim speed of well over a mile a minute — fast enough to trim off excess stock, shape contours, and cut bevels. On most stock, you use such a small part of the disk that you get the effect of a smooth, straight-line motion. To gain maximum speed, use the outer portion of the disk.



CROSS-GRAIN SANDING makes unsightly marks that are often invisible until you paint or stain. Cross sanding at left above fuzzes the wood so it soaks up stain and brings out marks.

When removing a lot of material, take successive light cuts. Heavy cuts will wear off the abrasive particles and tear the paper at the rim.

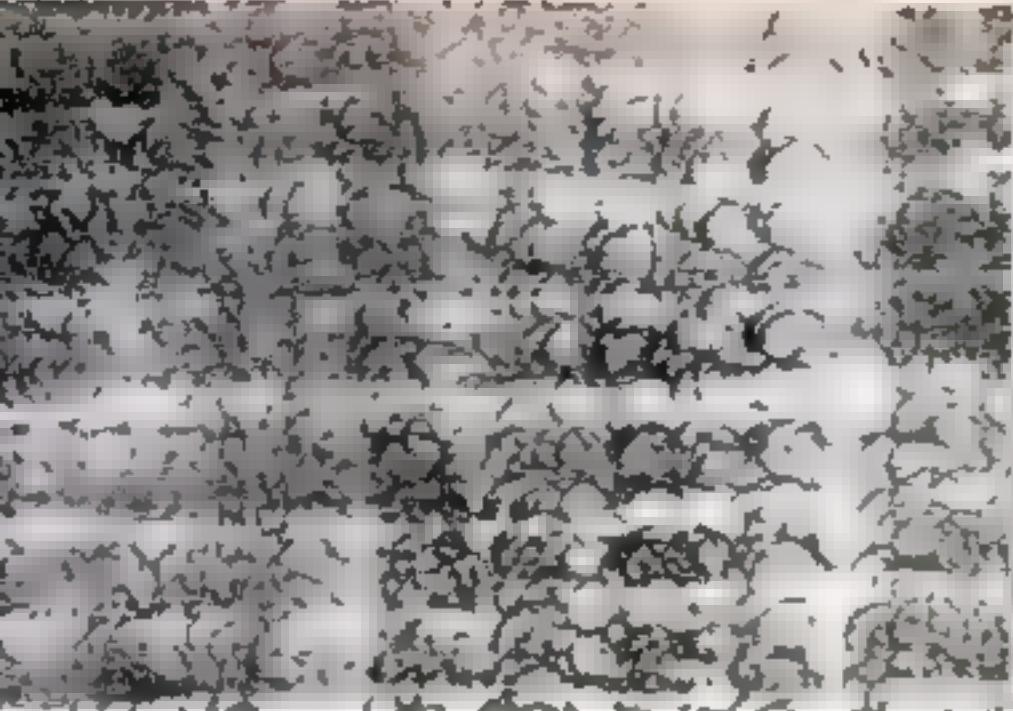
Reciprocating sanders. Their straight back-and-forth motion at 14,000 or so strokes a minute gives top quality with-the-grain sanding for final-stage work. But it's relatively slow on other stages as the total abrasive travel is only about 150 feet a minute.

The motor-driven models have somewhat longer strokes than the less-expensive vibrator type and cut a little faster. To speed up a reciprocating sander, use it across the grain in the rough stages. It will cut twice as fast this way. Then finish up with a final with-the-grain smoothing. Hard materials cut faster than soft ones because soft surfaces tend to give slightly with the strokes. A reciprocating sander is fine for plasterboard as it takes 20 to 30 seconds before it will cut through.

Orbital sanders have a combined straight and rotary motion that moves the abrasive in tight little orbits, about $3/16"$ wide at speeds of around 4,600 times a minute. They're medium-fast cutting because they work both across and with the grain at the same time. The circular marks are so tiny that they are generally invisible.

The difference between an orbital and reciprocating sander in the finish you get is not so much quality as appearance. Some pros argue that the reciprocating

with power sanders that shouldn't happen to anyone



TINY SWIRLS like these result when you move an orbital sander too fast or when particles break off and roll around underneath. Move slowly and keep loose grit cleaned away.

sander gives you a more mirrorlike finish, while the orbital type produces more of a matte finish. Other pros prefer the orbital because, in cutting in both directions, it tends to level all the grain equally. Straight-line sanders sometimes remove the soft grain at a faster rate than the hard grain, producing slight surface irregularities.

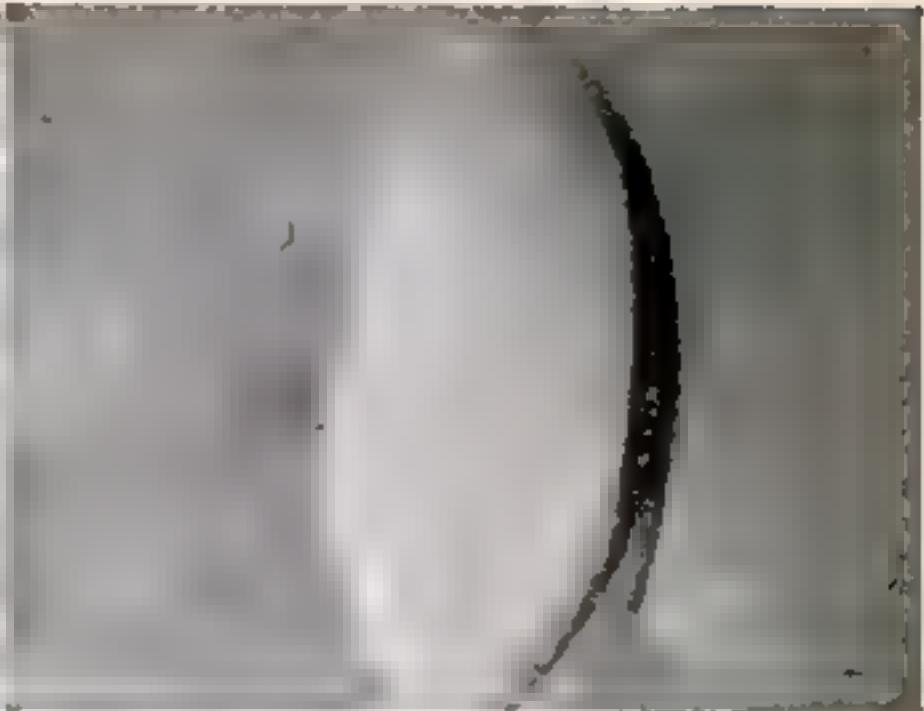
Sometimes loose abrasive particles make scars when they break off and roll around under an orbital sander. Where possible, use abrasive cloth, which retains its particles better than paper.

Drum sanders can be one of the most versatile shaping tools, yet are often overlooked by many who assume they're for use only in a drill press. This isn't true. Drums up to 3" in diameter can be chucked in an electric drill for freehand smoothing of holes and contours.

You can also mount drums in a chuck and arbor on a motor shaft to make a bench sander. By providing a slotted fence or table to limit the drum's cutting depth, you have an accurate edge or surface sander.

The belt sander is a fast worker and cuts a smooth swath. With a coarse grit, it will chew off thickness at an astonishing rate; with fine paper, its straight-line belt motion will give you a satin-smooth cabinet finish in a few passes.

One feature that can be both a help and a hindrance is the lack of any resilient cushioning on the steel backup plate. Instead of conforming to surface irregu-



DEEP GOUGE above shows what can happen when you hold a disk sander in one spot too long. The $\frac{1}{4}$ "-deep gash was made in 10 seconds with a 20-grit disk at 2,400 r.p.m.



RIM CAKE BUILDS UP when you sand paint or pitchy wood. If not removed, it keeps disk from touching uniformly, producing slow, uneven results. Flex the disk to flake the cake off.

larities, the hard-backed belt tends to level everything in its path. This is fine for surfacing uneven stock, but sometimes makes it difficult to sand out blemishes that lie in depressions.

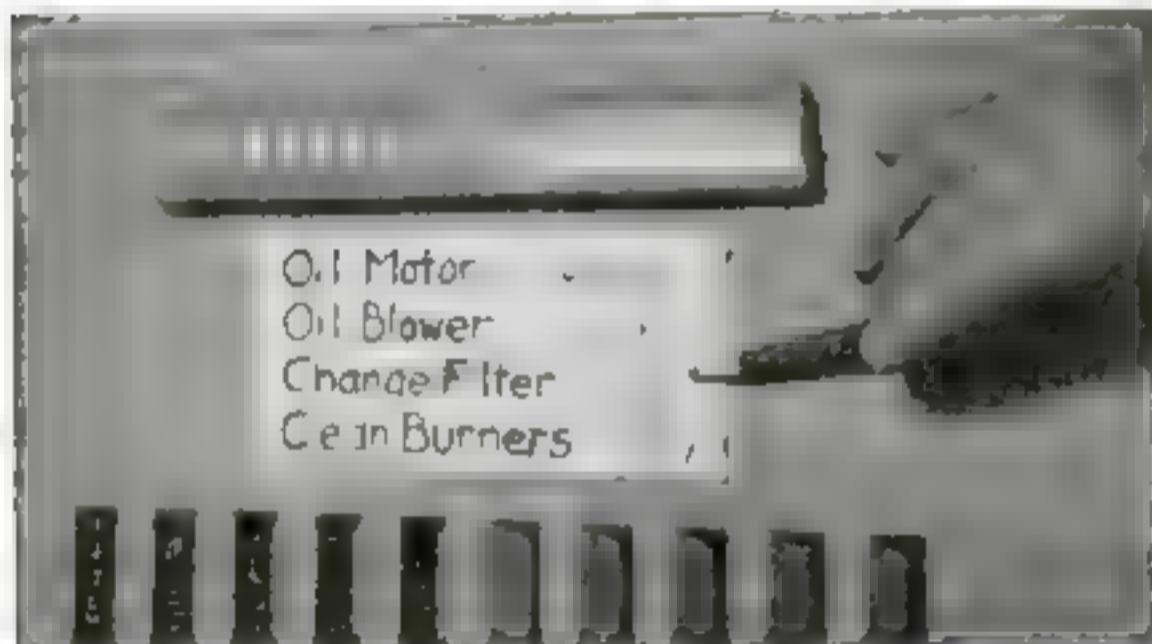
One useful trick on cupped boards is to move the sander along at a 45-degree angle to the grain so the belt rides the high edges and cuts them down. Usually one pass in each direction and a final one with the grain will put a cabinet-grade surface on once-useless lumber. For top speed in rough sanding, you can run the tool across the grain—but watch out for split-outs at the edges.

Short Cuts and Tips

FROM PS READERS

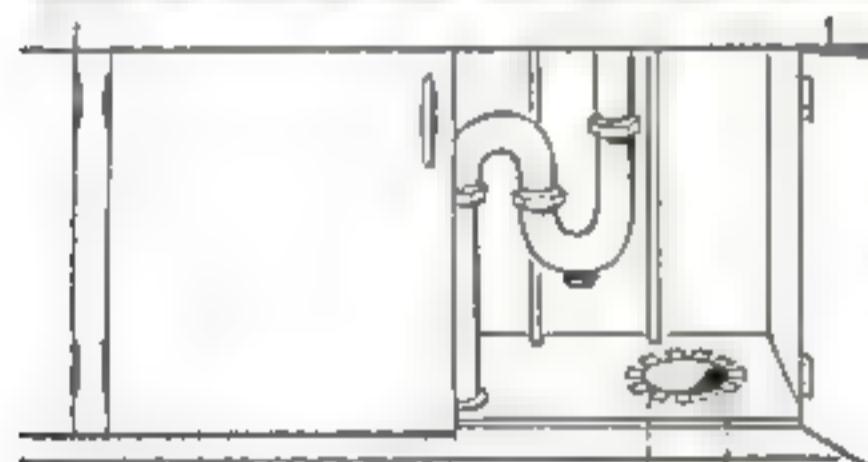
Headlight for Dark Corner

A TELEVISION or radio repairman has both hands free for work if he wears an electric lamp strapped to his forehead as a coal miner does. I have found that it's especially useful for working on a TV in a customer's home, since the set often is located in a dark corner.—*Philip A. Farino, Chicago.*



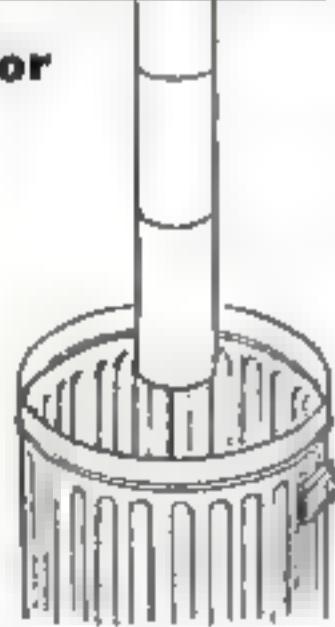
Maintenance List Safeguards Heater

BECAUSE the heating plant is the most important mechanical unit in the average home, it ought to be maintained with care. As a reminder of what should be done at intervals, I have taped a check card to the front of mine as you see in the photo.—*Robert Hertzberg, Douglaston, N. Y.*



Basement Chute for Kitchen Cans

THE sketch shows how we save time and footsteps in disposing of tin cans. We open the cabinet door under the sink and drop them into a basement container.—*R. M. Mitchell, Hinsdale, N. H.*



How to Weld Sheet Plastic

TEARS in plastic raincoats, auto-seat covers, swimming pools, and other sheet products can be repaired with a welded seam. Separate sheets can be joined the same way. Place aluminum foil on each side of the overlap and run a hot soldering iron quickly along it in one stroke. The foil—which can be re-used—prevents burning, helps distribute heat to fuse the plastic.—*Robert Micals, Freehold, N. J.*

Body contouring and a clever tilt design give you all-position comfort in a—

Modern Lounge Chair for \$15



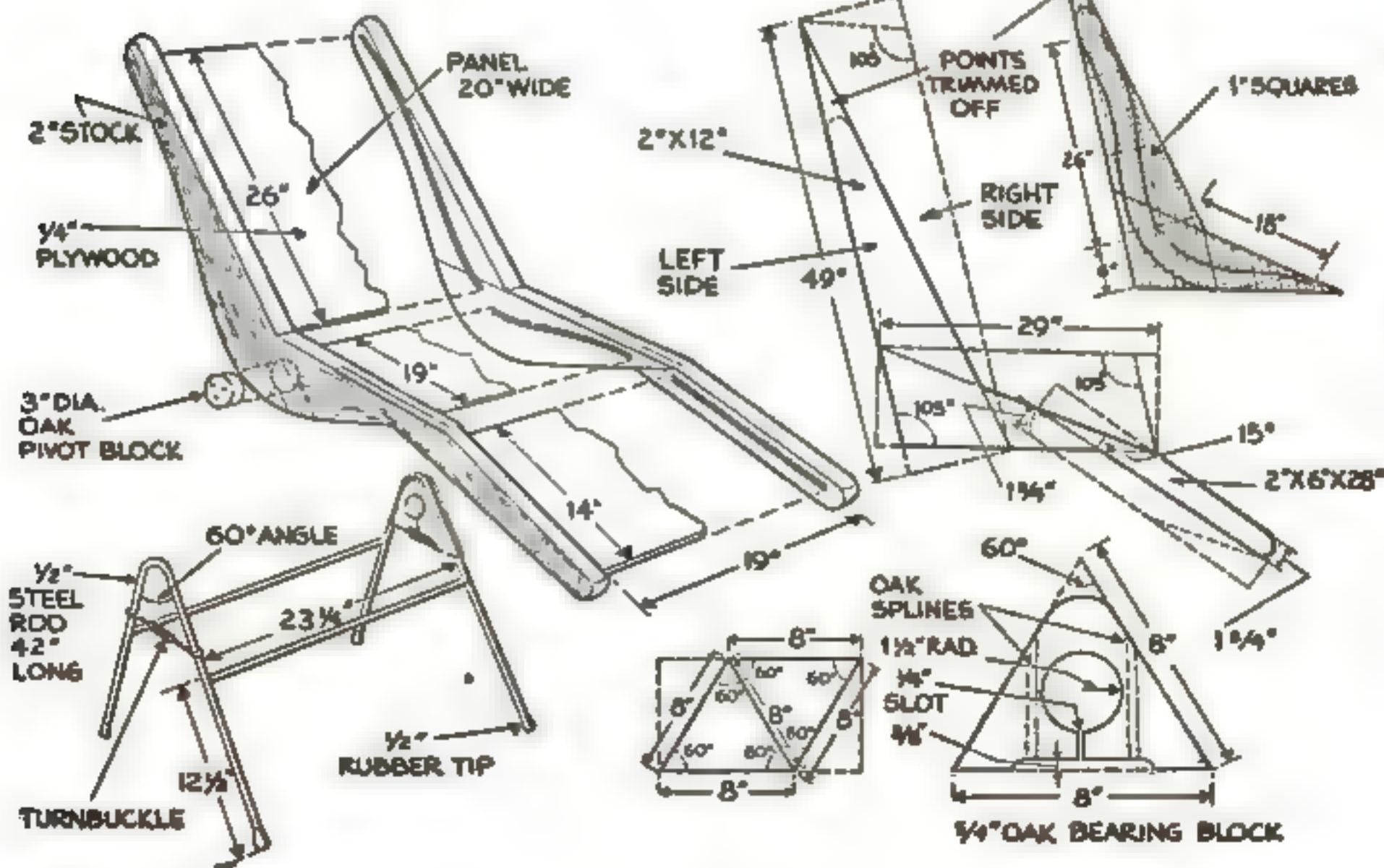
By Paul Corey

SLICK carpentry makes possible this unusual reclining chair. With its trim design, it takes up little more space than an ordinary chair, yet gives you full-length comfort in any position from sitting to reclining.

The secret lies in forming the chair's

side frames with half-lap joints so big and sturdy that they amount to a laminated construction. This tremendous strength permits the frame to be slimmed down to give the delicate lines of finely crafted furniture. Total cost: less than \$15 worth of ordinary materials put together in an un-ordinary way.

A single pivot point permits the chair



to tilt forward or back to any angle. A tightening device on the pivot bearing enables you to adjust the tension to the precise point where the chair can be shifted easily with the weight of your body, and yet remains fixed in any desired position.

Laying out the parts. The side frames are easy to cut because each matching pair for the back, seat, and leg rest is sliced out of one piece of wood—you automatically get duplicate parts with no waste.

The two side pieces for the back are made by sawing a 49" length of two-by-twelve lumber diagonally from corner to corner, as shown in the drawing. The parts for the seat come out of a 29" length of two-by-twelve in the same way. A 28" length of two-by-six, ripped down the middle at a slight angle, produces the two tapered pieces for the leg rest.

If you prefer hardwood for the frames, the design is so sturdy that standard 5/4" stock—usually 1 1/8" actual thickness—is strong enough.

Making the half-laps. These are whopping-big joints, but not as terrifying to cut as they may seem. A dado blade or router will do the job quickly. You can also use a handsaw, slicing each piece edgewise and removing half the thickness to form the lap.

The angles at which the half-laps meet

are determined as shown in the drawing, and the pieces are glued and clamped. The chair's back, seat, and leg support are three separate panels of $\frac{1}{4}$ " plywood 20" wide. These fit into $\frac{1}{4}$ "-by- $\frac{1}{2}$ " grooves in each side frame.

Templates for the S-shaped grooves can be cut from strips of cardboard marked off in 1" squares. The grooves can be made with a router bit or by drilling a series of overlapping $\frac{1}{4}$ " holes and chiseling out the waste by hand. The lower grooves for the leg rest are straight and do not require a template.

The contour line along the back and lower edges of the side frames is an exact copy of the curves formed by the grooves, but located $2\frac{1}{2}$ " beyond the grooves. You can establish this shape quickly by running a drawing compass or homemade pencil-holding jig along the grooves to mark the corresponding contour line on the outer edge of the wood. When the side frames have been completed, the $\frac{1}{4}$ "-plywood panels are glued into the grooves by springing them slightly and snapping them into place.

Shaping the legs. Two 42" lengths of $\frac{1}{2}$ " steel rod are bent in the middle to a 60-degree angle to form the two A-shaped leg frames. The bearing blocks for the pivots are best made of hardwood, such as 5/4" oak. These are cut to form rounded triangles that fit the leg angles.



Oversize half-lap joints are the secret of the chair's strength, permitting slim yet sturdy side frames. Glued and clamped, the joints need no screws to hold them together.



REAR CONTOUR OF CHAIR matches the curved seat grooves. You can mark it by tracing the grooves with a homemade compass—a stick with a nail at one end and a pencil at the other.



The contoured seat and back are shaped to fit the body comfortably

THIN PLYWOOD PANELS, easily bent, are the key to the chair's relaxing design. The panels are glued into S-shaped grooves in the side frames to form the body-fitting seat and back.

SPLIT-RING BEARINGS let you adjust the tilting mechanism so the chair balances at any angle. Turnbuckle squeezes the rings to vary pressure on the round pivot blocks.



HARDWOOD SPLINES $\frac{1}{2}$ " wide by $\frac{3}{4}$ " thick are glued into dadoes cut in the back side of each pivot bearing. These stiffen the bearings so they won't split when they're squeezed.

A $\frac{1}{4}$ " slot in the bottom of each bearing block permits the blocks to be squeezed up tight around the pivots on the chair frame. To keep the blocks from splitting when they're squeezed, the sides are grooved across the grain on each side of the center hole to take $\frac{1}{2}$ "-by- $\frac{3}{4}$ " oak splines that serve as stiffeners.

The bearing blocks are wedged inside the steel-rod A frames and held tight by turnbuckles hooked around the rod. The eyes in the turnbuckles are opened first to let them slip over the rod, then bent closed. A recess in the bottom of each block enables you to tighten or loosen the turnbuckles to adjust proper tension. Have the two cross rods that join the A frames welded in place before installing the bearings.

The location of the circular pivot blocks on the chair's frame depends on your own

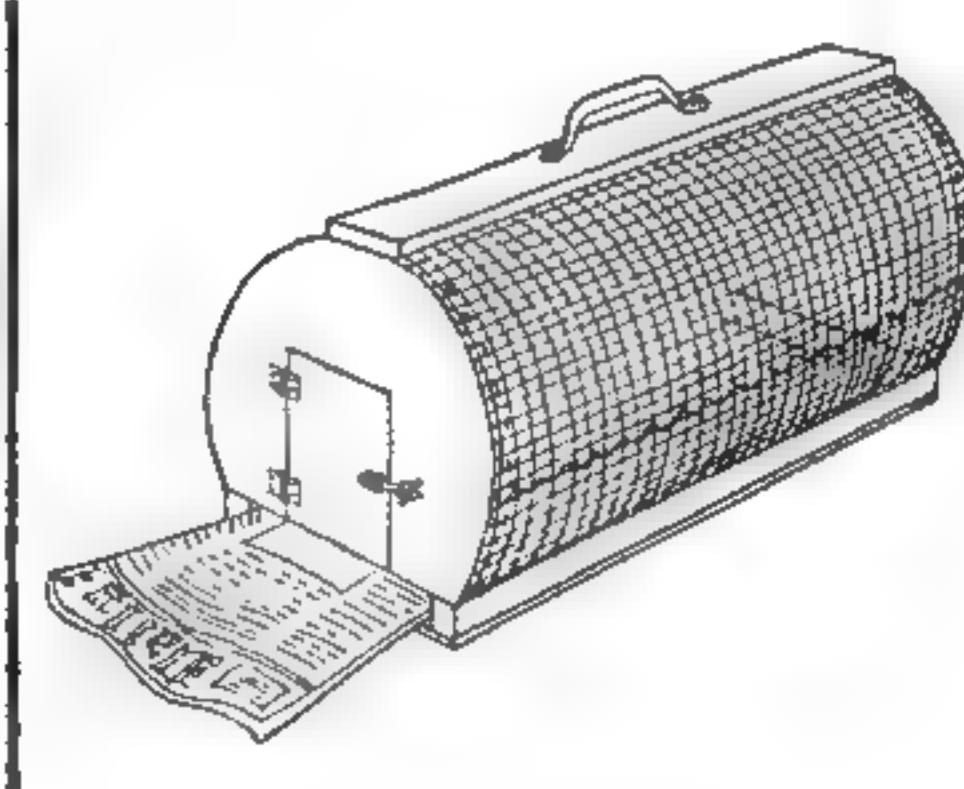
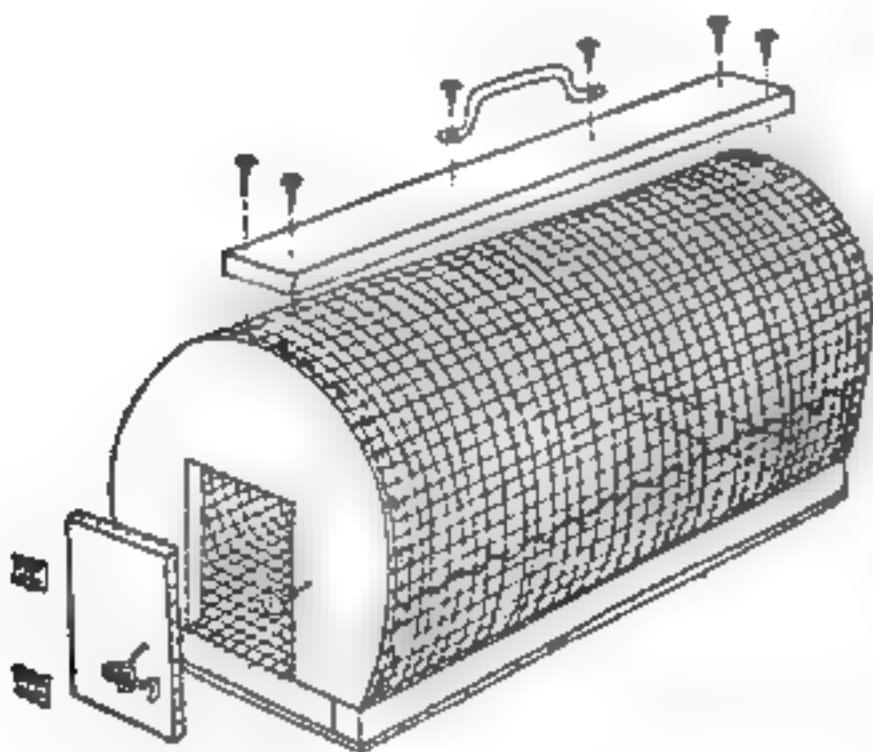
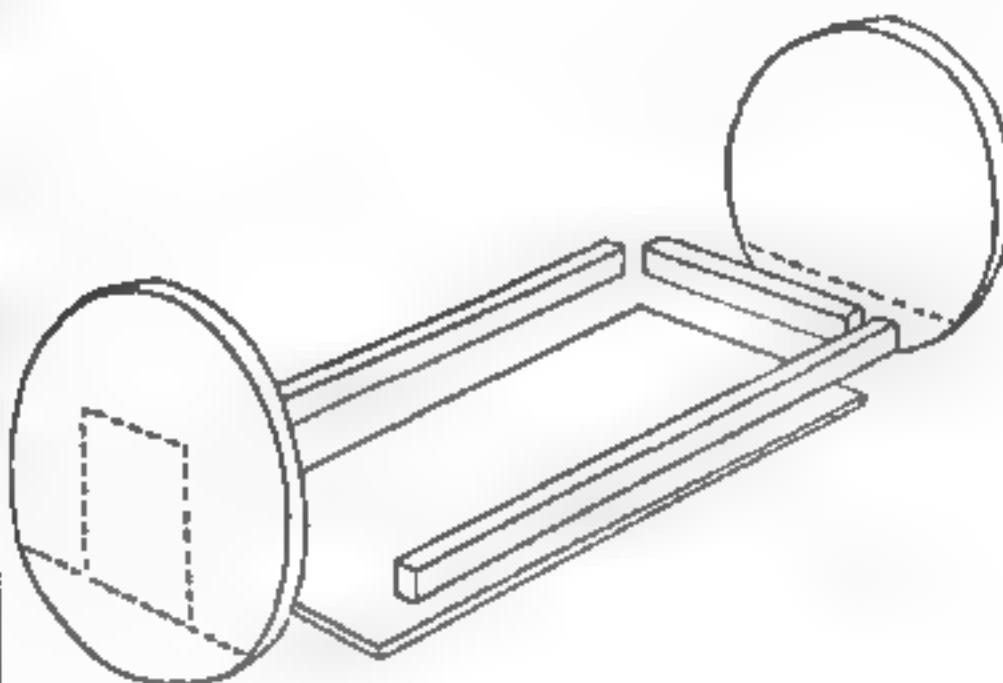
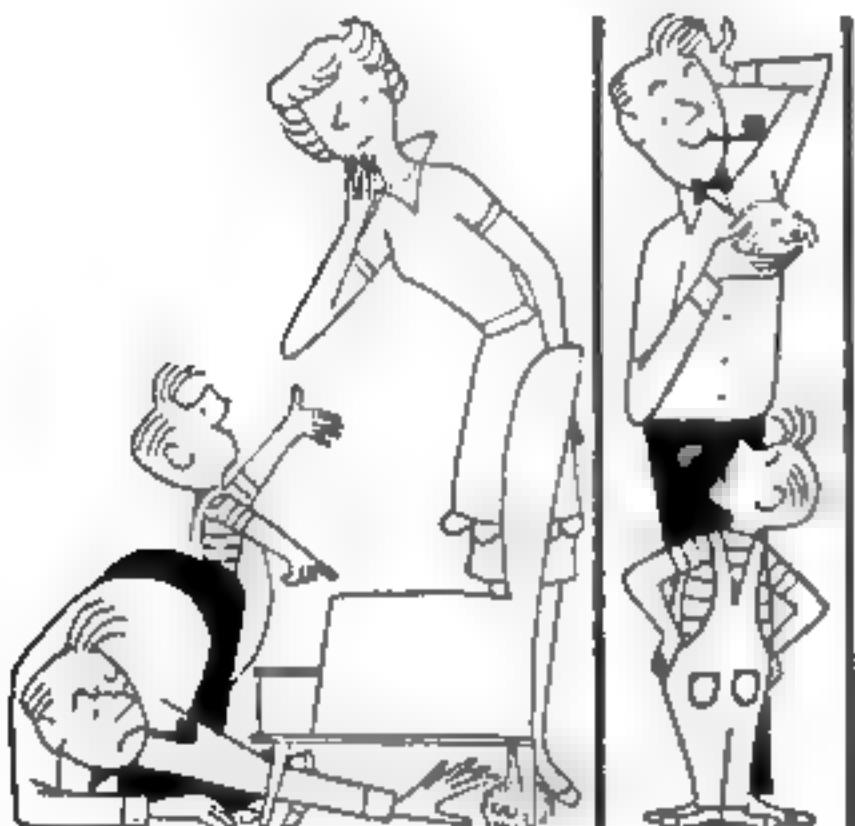
personal center of gravity. For persons of average height, they should be spotted $2\frac{1}{2}$ " to 3" forward of the point where the seat and back meet. Taller persons may want them set even farther forward. It's best to experiment before screwing them completely into place.

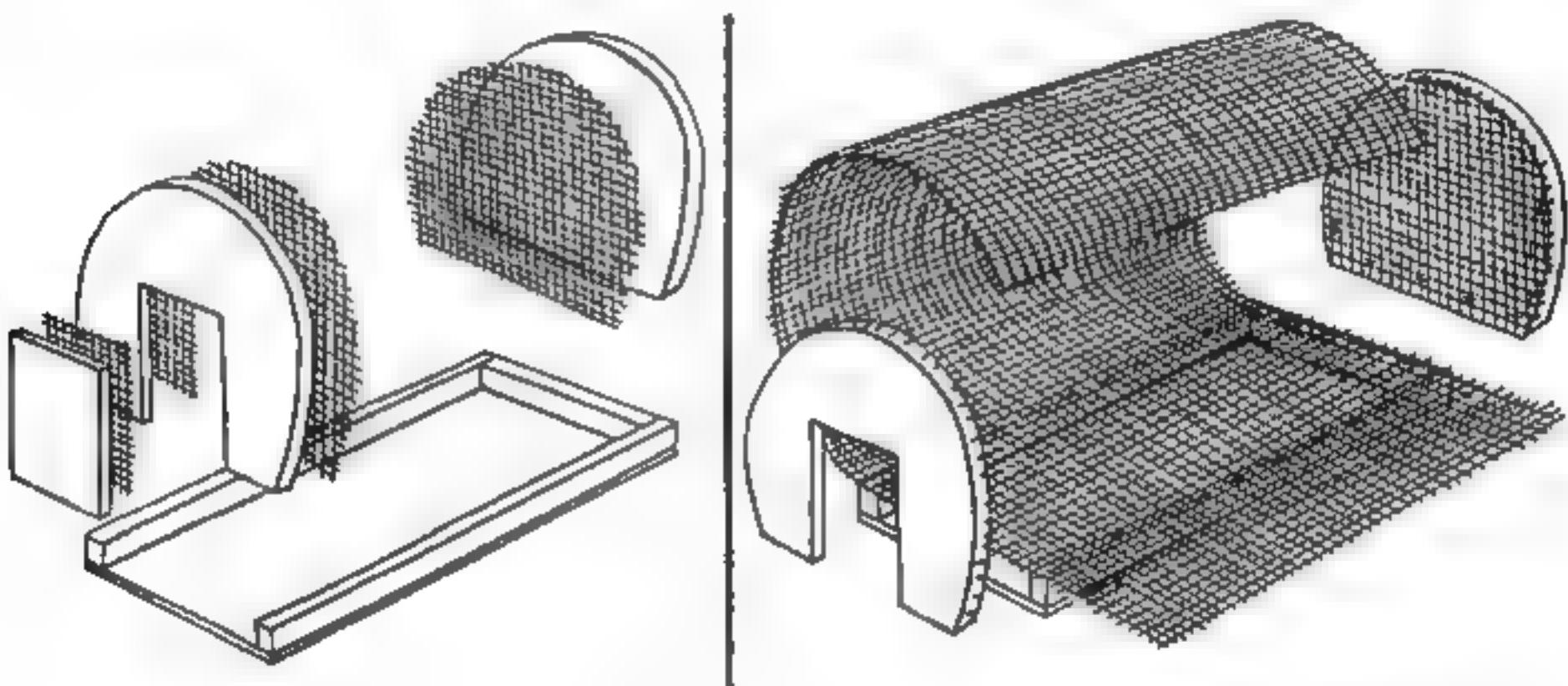
Upholstering the chair. The plywood seat, back, and leg panels are padded with strips of 1"-thick foam rubber. The strips are the same length as each plywood panel, but are cut $\frac{1}{2}$ " narrower at each side.

Colorful plastic upholstery material is wrapped around the foam rubber and tucked underneath at the sides. At the ends, the plastic material is carried around the edges of the plywood panels and stapled underneath. The chair's wood frame is given a natural finish, and the metal legs are painted flat black.

Wordless Workshop

By Roy Doty
and Hubert Luckett





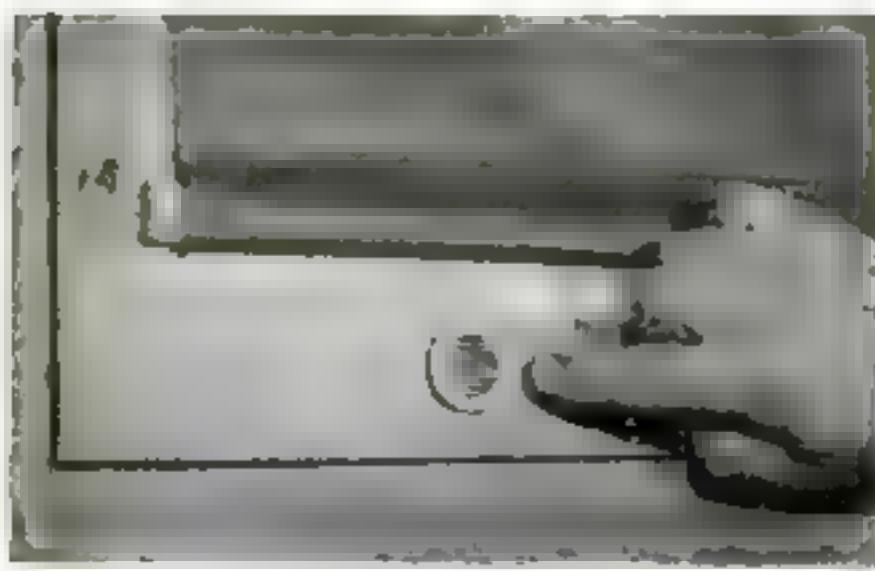
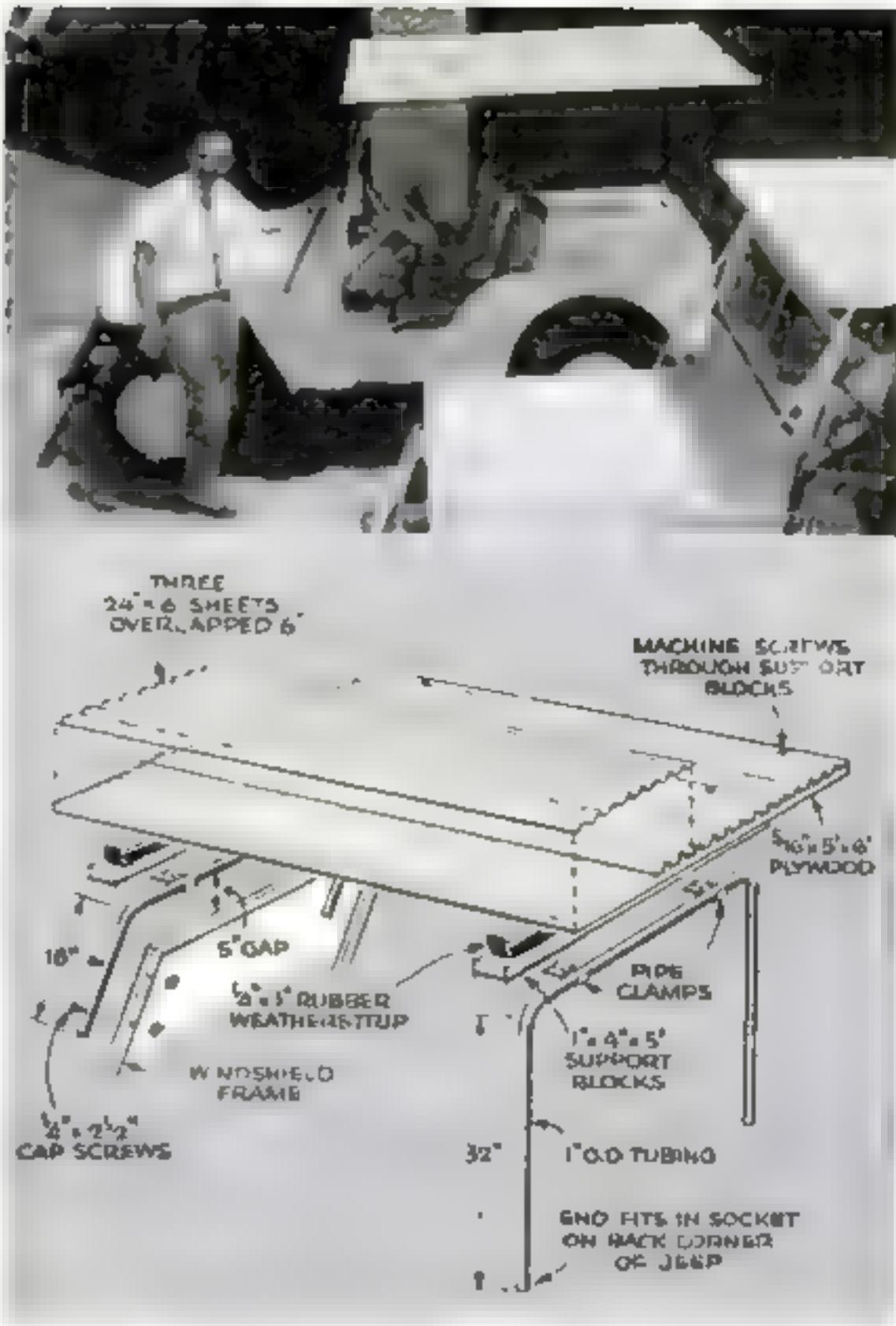
Short Cuts and Tips

FROM PS READERS

Permanent Sun Roof for Desert Jeeps

FOR some years, I've been prospecting the Southwest's deserts. When my Jeep's canvas top gave out, I replaced it with a canopy of corrugated aluminum. This reflects up to 85 percent of the sun's heat, and the plywood beneath stops radiant heat. Braces in front of the windshield add support. They are 28" pieces of $\frac{1}{2}$ " tubing bolted between frame and pivoting arm of the windshield. Now I keep cool at 160 degrees.—Noel R. Kirk, Hollywood, Calif.

►►WHEN you find it necessary to slot a strip of thin metal lengthwise, band the strip around a piece of curved wood, place it in a vise, and cut the slot with a hacksaw.—E. L. Enochs, Modesto, Calif.



Breathers for the Furnace

WHEN you weatherstrip basement windows, bear in mind that furnaces require a supply of air. I provided it by boring 1" holes in the window nearest the burner and pushing in small round louvers, the kind made for condensation control by ventilation of outside walls. Hardware stores sell the louvers in boxes of 10.—R. Hertzberg, Douglaston, N. Y.

►►SCENIC wallpaper can be cut to size and used as a picture. We pasted a scene on the wall and framed it with molding strips screwed to the wall. A coat of clear varnish gives the paper an antique finish.—Joanne Vosburg, Syracuse, N. Y.



Line Goes Up and Down Fast

BY ATTACHING a screen-door hook on each end of an indoor clothesline, you can put it up and take it down in a jiffy. Put screw-eyes where you'll fasten it.—Wayne Floyd, Fayetteville, Tenn.

The man says:

It's a Son-of-a-Turkey

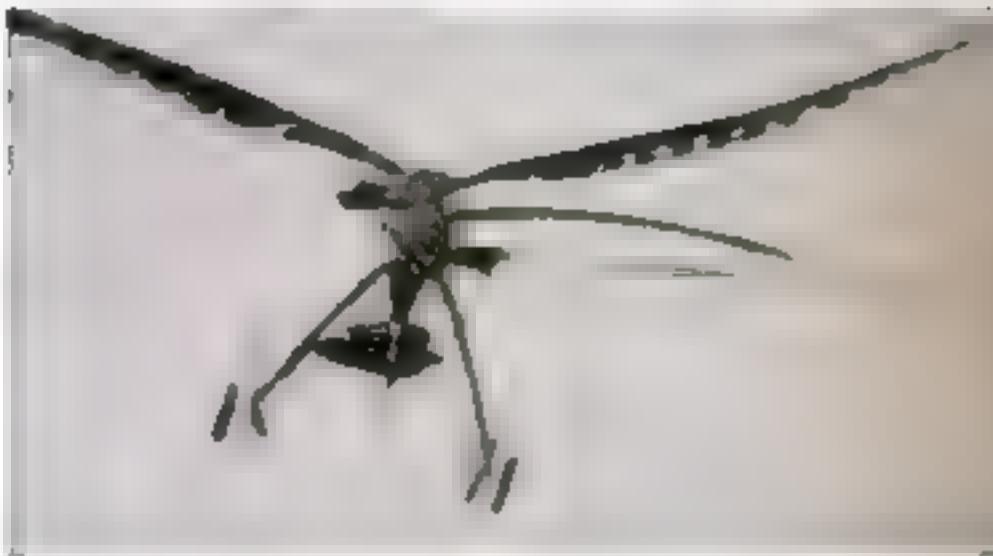
**Why bother gluing up wings
for a control-line plane when
turkey feathers work so well?**

WHAT kind of wing can lift 40 times its weight? A wing of turkey feathers—and it's nearly crashproof.

The two feather parts that make up the wing of my Son-of-a-Turkey U-control model weigh one-tenth of an ounce. The weight of the plane is four ounces. In most models the wing lifts no more than 10 times its own weight. And even then the wing is a weak spot. Feathers almost never break.

How can feathers lift so much? Because of built-in camber (curvature control). When the work of lifting makes the quill bend up, camber increases and throws air down faster. This is like putting down the flaps on an airplane to increase lift.

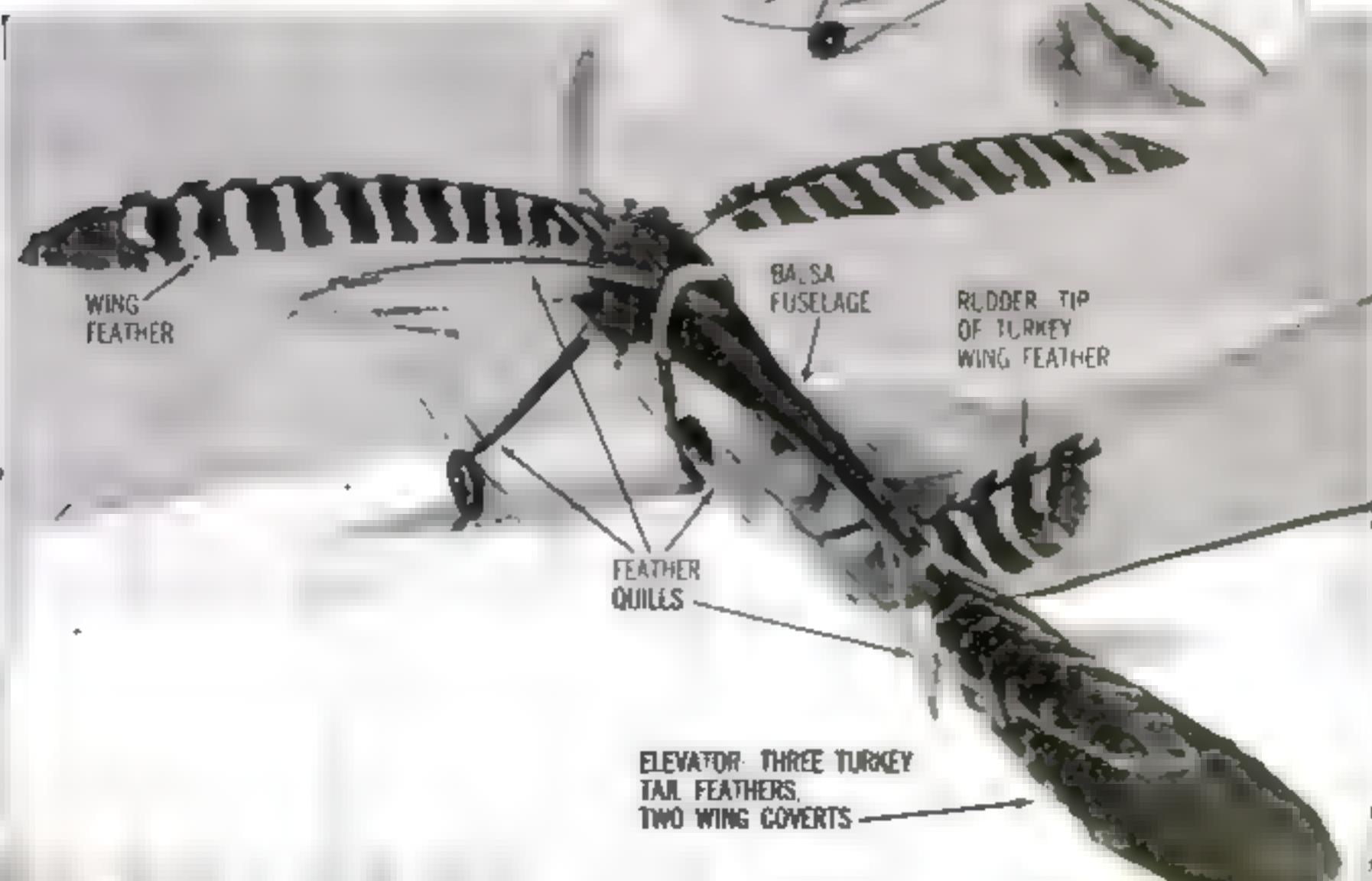
The Son-of-a-Turkey cruises at 25 m.p.h. The wing can stand more than 40



m.p.h. without damage, even during violent maneuvers. The plane climbs well, pulls out of dives, and even glides a little when the engine runs out of fuel.

The feather plane is an excellent trainer for U-control pilots. They can make the plane climb, dive, or loop while it flies in a circle. A U-shaped handle moves the elevators. The long tail prevents overcontrol—a beginner's headache. The quill landing gear can take hard bumps. A quill boom supports the control lines because of wing flex in flight.—*Dudley S. Lynch, Sunnyvale, Calif.*

WINGS CURVE DOWN normally but straighten out in flight. The feathers chosen as wings were the fourth from the leading edge of a turkey's wings. The elevator hinge is covered by a covert feather. Engine is a .049 Thimble-Drome Babe Bee fitted with a nylon propeller.



Short Cuts and Tips

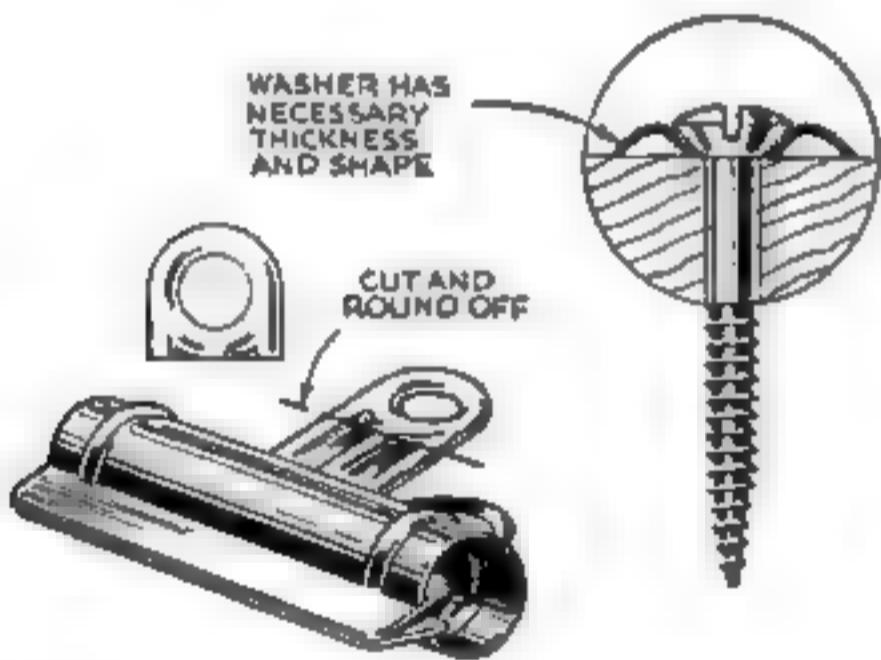
FROM PS READERS



Now Watch the Funny Birdie

HAVING trouble getting youngsters to give you the expression you'd like for a photo? Try my trick. I sketch a funny face on a paper plate and thumbtack the

plate to a stick. Keeping the face turned away, I pose the subject. When everything's ready, I quickly turn the face to view. Click—and I've got what I want.—*G. D. Farkell, White Bear Lake, Minn.*



Washer from a Clip Handle

WHEN you need a countersunk washer under a screw in soft wood, leather, auto trim, or materials that a screw head alone would penetrate, a fair one can be made from a spring-type paper clip. Use tin snips to cut off one holed thumb end above the clamp. Such clamps come in several sizes, and you usually can find a good fit.—*Harry Walton, White Plains, N. Y.*

►►►OUR wall clock was becoming so noisy it was driving us out of the room until I removed the back and blew in powdered graphite. I left the clock on its back for several days until the graphite worked into the bearings. This stopped the noise.—*W. R. Clark, Houston, Tex.*

PS Favorite

Originally published in November '55 PS, this article has brought so many inquiries in the six years since that it is being rerun. If you remember any other old classics that you'd like to see again, we'd be pleased to have you send in your nominations.



What Steel Is That?

All of it looks pretty much alike, but there are simple tests that will help you pick out the type best suited to the job

By John Burroughs

WHEN the man in the machine shop said I could help myself, I fished the piece of steel out of the scrap barrel. It was a bar about $\frac{1}{8}$ " thick, $1\frac{1}{4}$ " wide, and 10" long—just the right size for the blade of the sheath knife I wanted to make. I put it in my pocket and went home happier than a pack rat with a new penny.

But then I began to wonder what kind of steel it was. Suppose I heat-treated it, fitted grips, and worked down the cutting edge—only to find that I had wasted all my work on the wrong stock.

That evening I chased over to ask

Dutch Morgan whether the bar would make a civilized knife. I found him in his basement, inching the flame of his blowtorch along an old clock mainspring.

"Making a cookie cutter," our best tool-and-die man admitted sheepishly. "Betty's invited the girls in her club to a get-together, and she thought it would be ducky to serve cookies shaped like the club emblem. I'm softening up this spring so I can bend it to outline. Then I'll solder it to a backing plate."

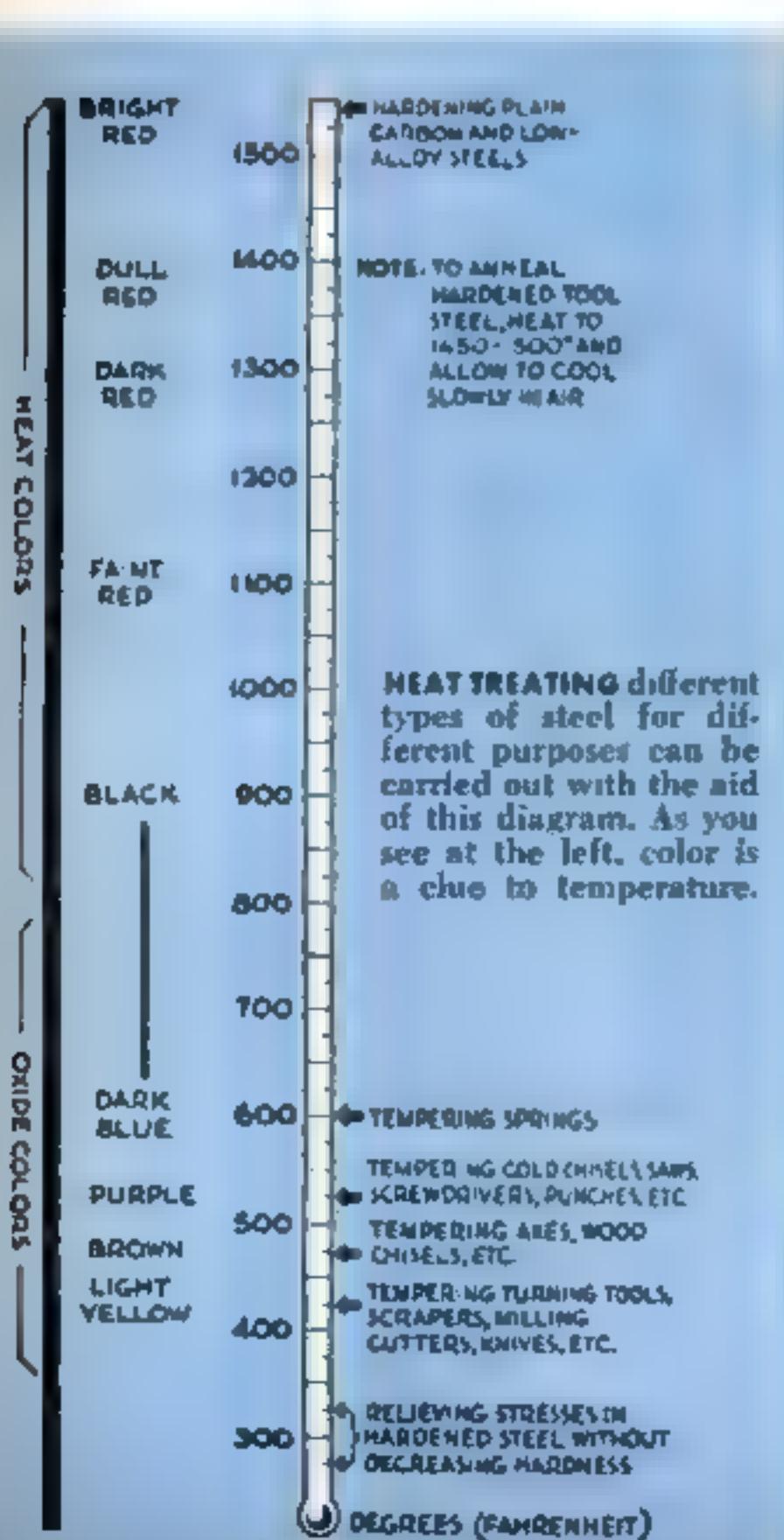
I showed Dutch my piece of steel. "Is this the stuff they use for cutlery?"

Dutch ran his thumb along one edge of the bar. "Ground stock," he said. "It's probably a piece of electric-furnace

These tests tell you what steel you're using

FILE TEST: Mild steel files easily; tempered tool steel is fairly hard to file; and hardened, high-carbon steel can't be filed at all. Between the first two types are medium-carbon steel and annealed (softened) tool steel. The difference between these can't be detected by a file test.

HARDABILITY TEST: To find out whether fairly easily filed stock is medium-carbon steel or annealed, high-carbon tool steel, heat a sample until it glows bright red, and then plunge it into a can of oil. If it comes out file-hard, you've got yourself a piece of tool steel.



tool steel. Run-of-the-mill machine steel wouldn't have a ground finish."

If hat the sparks can tell. Loosening a screw, he removed the guard from his grinder and switched on the motor. Touching the stock to the top of the wheel, he studied the shower of sparks that streamed out horizontally.

"That's what I thought," he nodded. "It's a low-alloy chrome-vanadium tool steel. About point 90 or 1-point-10 carbon. Yeah, it'll make you a good knife."

I was impressed. "You mean you can tell all that from the sparks?"

"It doesn't give you a complete analysis," he admitted. "But it's a quick way to tell one steel from another. Here, try it. As a start, look for sparks that break up in bursts. The more bursts, the more carbon content."

I did as he suggested, taking experimental grinds at the tool steel, a nail, the end of a file, and the blade of my pocket knife. "The fireworks sure are different," I admitted.

The hardening test. "Want to whack a half-inch off your ground stock and try hardening it in oil?" Dutch asked.

While I went at the bar with a hacksaw, Dutch brought a can of oil from his garage, and pumped up the blowtorch. Propping on a firebrick the bit of metal I'd cut off, we heated it red-hot. With his pliers, Dutch snatched it up and



SCRATCH TEST: Draw a corner of the hardened sample across a piece of glass. Fully hardened high-carbon steel will leave scratches on the surface. This kind must be worked while annealed, then hardened, and, finally, reheated at about 400 degrees to relieve internal strains.



SPARK TEST: Touch the stock to a grinding wheel and study the shower of sparks in subdued light. The pattern will tell you the approximate carbon content, whether the steel is alloyed, and with what. Three typical spark patterns are shown in the drawings below.



MILD STEEL throws off strong, light-yellow lines ending in brilliant, white, orange-tipped tongues. Inter-spersed with the lines are a few simple carbon bursts.

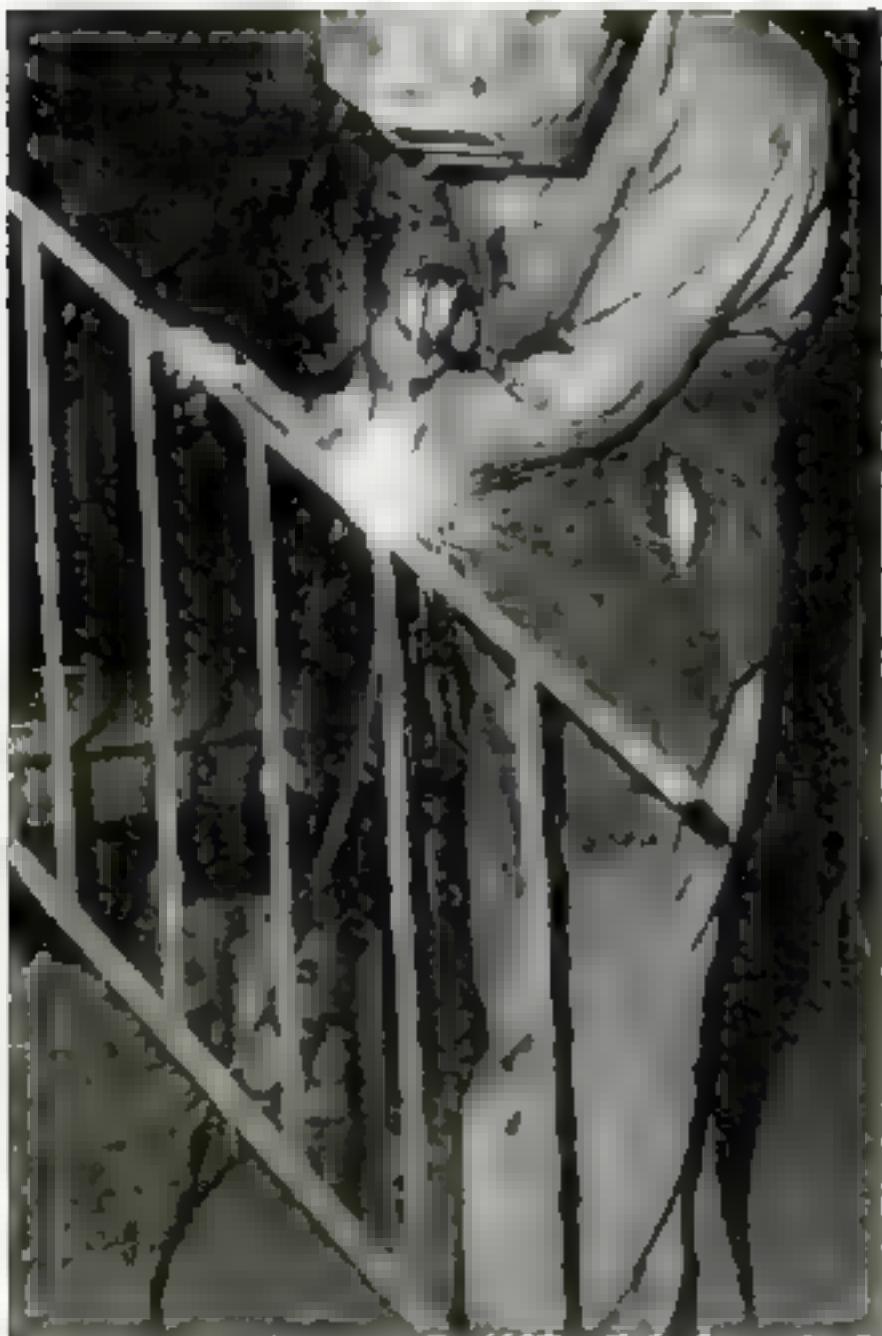


HIGH-CARBON TOOL STEEL sparkles with fine, feathery bursts. The more plentiful and complex the bursts, the higher the carbon content. Neither hardening nor annealing changes the pattern.



LOW-ALLOY STEEL is identified by disjointed orange lines, with some carbon bursts which the alloying metals tend to suppress. Forked tongues at the end of the spark stream identify nickel; long dark-yellow lines, chrome; very bright sparks with increased spray around the wheel, manganese; and red-brown lines with bright-orange tongues, tungsten.

Typical jobs for various steels



HOT-ROLLED MILD STEEL is too low in carbon content to harden when heated. Tough, it can be twisted or bent, and it welds easily. Use it for assemblies like this decorative stair rail.



COLD-ROLLED MACHINE STEEL, which comes in bars, rods, and plate, is good for shafting and structural parts. Rolling it cold toughens this low-carbon steel and gives it a smooth finish.

dunked it in the oil. When it had cooled he wiped it and tossed it to me.

"Try scratching that bottle on the bench," he said. Sure enough, the steel scratched the glass.

"It works," I admitted, "but I don't see why. How come only high-carbon steels harden? Where does the carbon get in the act?"

The point system. "It forms hard carbides when you quench the stock. Any steel with more than 70 points of carbon will turn file-hard."

"Points?"

"That's just a convenient way to express the carbon content. A point is one-hundredth of one percent. The whole deal is a little like making fudge. How a batch of steel turns out depends on what you throw in the pot, how you cook it, and how you cool it. It's either soft and gooey-tough, you'd say—or it's hard and brittle."

Now that I thought of it, I didn't know anything about iron or steel making. So I pumped Dutch on that, too.

"It's like this," he explained. "First you fire up some iron ore, coke, and limestone, and pretty soon molten iron runs out at the bottom. If you pour it into molds, it becomes cast iron.

[Continued on page 218]



HIGH-CARBON STEEL can be worked with comparative ease when annealed. This is the stock you use for making special tools like this star-tipped punch, lathe-tool bits, or knives.

Short Cuts and Tips

FROM PC READERS



Tomato Basket Holds Shine Kit

BECAUSE it has a handle, one of those rectangular tomato baskets from the market will serve nicely as a home shoeshine kit or portable tool kit. The length of the basket, about 2', is just right for holding the tools or shining equipment you need.—*Marylu Walters, Syracuse, N. Y.*



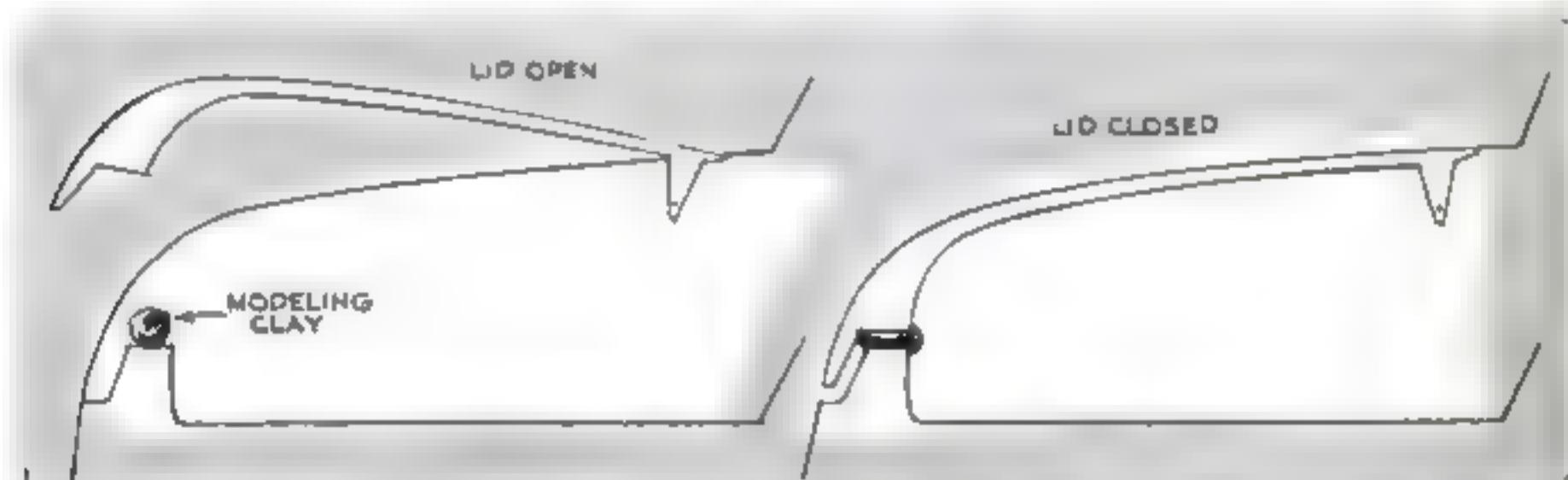
Fold-Away Shoe Scraper

ATTACH a large strap hinge low on the wall outside the entrance to your house. It makes a handy shoe scraper for mud or snow. When not in use, the long leaf folds back flat where it won't be a hazard.
—*Anthony Capotosto, Jersey City, N. J.*



Bend-Proof Photo Packing

TO DISCOURAGE postmen from bending packages of photos to get them into a small mailbox, reinforce the packages with scrap pieces of perforated hardboard. These add only a few cents to the postage.—*R. Hertzberg, Douglaston, N. Y.*



For Hard-to-Measure Spots

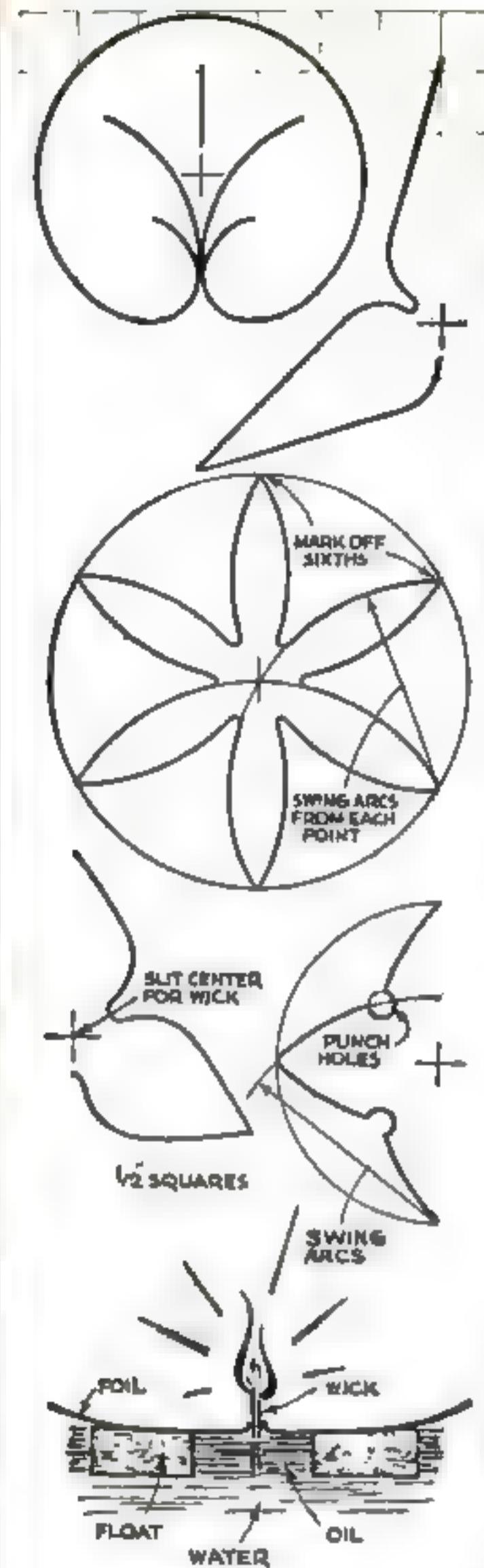
I HAD to know the clearance between the lid and latch of my car trunk to install a new gasket. To measure it, I borrowed some of Junior's modeling clay. A wad of clay, placed at the critical spot

and compressed by the lid, gave me the dimension.

The same idea will work as well for other interior measurements. You may have to oil some surfaces or insert a sheet of waxed paper to keep the clay from sticking.—*C. T. Pearson, Vermillion, S. D.*

Floating Candlelight

Pour cooking oil on water, light wicks in aluminum-foil holders, and you have a different kind of light



FESTIVE TABLE LIGHTS are fueled by a layer of cooking oil floating on water. Big glass marbles or weighted wax flowers may be immersed in the water to add color and enhance the effect.



USE A COMPASS to lay out flowerlike geometric figures like these, or space the full-size petals around a circle. Neat inside corners are formed by a paper punch. Scissors serve to cut foil salvaged from a ready-mix cake pan. Rub out the fold marks with a rounded object.

GOLDEN flames that seem to float on water shed a fascinating kind of light on festive tables. Unlike candles, these floating lights will never drip wax or droop in a warm room. The fuel is ordinary cooking oil. A thin layer on top of the water burns for hours, without smoke, odor, or explosion hazard.

Cut wick carriers out of extra-heavy aluminum foil, such as frozen precooked foods and ready-mixed cake doughs are sold in, using ordinary scissors. Lily pads or flowerlike geometric patterns are especially apt, and colored foil is especially decorative. But don't use metallized paper; it isn't fireproof.

Make the floats of cork or balsa about $\frac{1}{4}$ " thick. Cut them slightly smaller than individual petals so they won't show from the top. Apply a coat of waterproof contact cement to each float and to the foil, let it dry, and carefully press the float into position. In the center of each wick carrier, punch a small hole with a sharp point, or make two tiny cross slits.

Wicks are $\frac{5}{8}$ " lengths of soft, absorbent cord, or wicking melted out of a candle. Cord can be dipped in hot wax as well; waxed wicks are easier to push into the carriers, and they light more readily. Insert wicks halfway into the holes.

After pouring water into a bowl, add

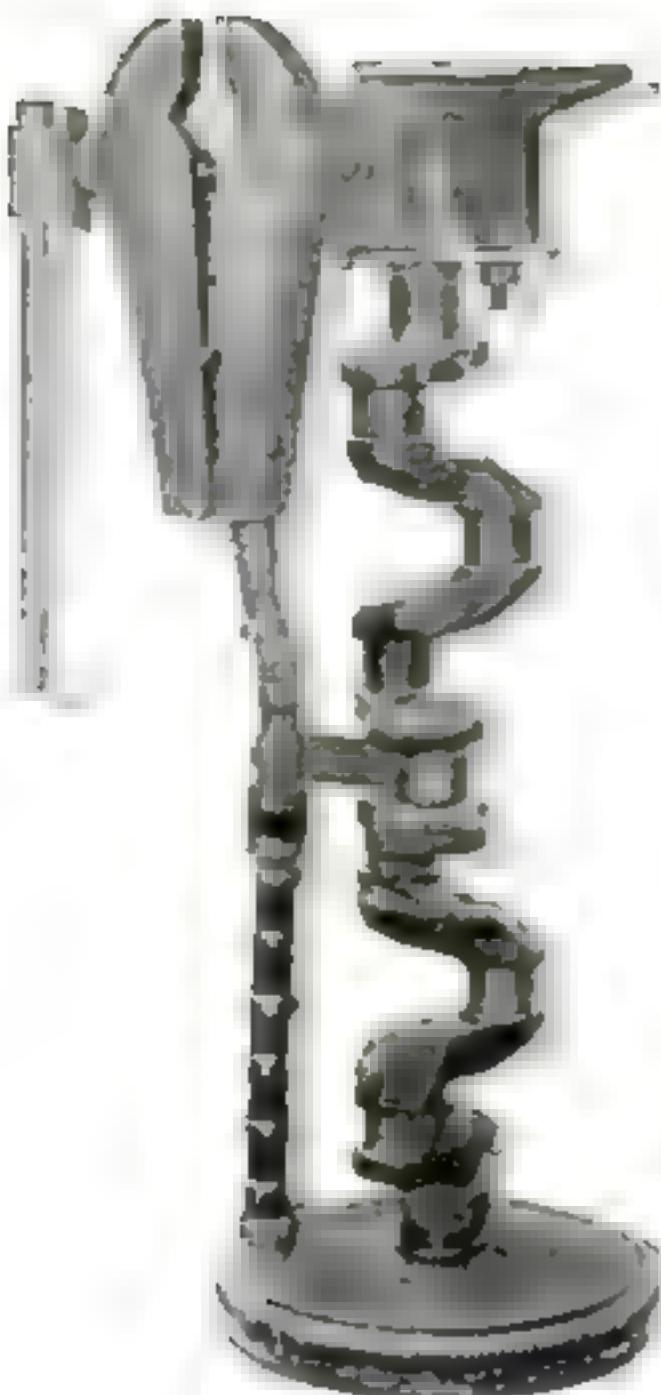
CUT FLOATS thick enough to lift the foil out of the oil layer. The big circular float shown on the four-petaled wick carrier above must be deeply grooved on the underside to let oil reach the wick in the center. Cement or staple the floats to the foil wick carriers.



POWER FAILURE? An emergency light made in a jiffy from a foil milk-bottle top, cork, and soft string will burn three hours on a thin layer of oil. Staple three floats to the underside of the cap (or simply crease the foil under them). Flatten foil between floats to let oil reach the wick. Place enough water in a wide-mouthed jar to bring the flame above the rim.

enough cooking oil to spread over the entire surface. Drop the lights in gently, wait for unwaxed wicks to draw up the oil, and light.

Should a flame be long and smoky, the wick is overlong or too thick. Try slightly thinner cord, or pull out a few strands. If flames sputter, the oil is running out. Lights can be blown out and relit, but if wicks become water-soaked, replace them. To save unused oil, pour it with the water into a jar you can cap. Wipe off the foil lights before storing them and discard used wicks.—*Harry Walton*.



5 Projects for the Man Who Can Weld

Sturdy Mount for a Leg Vise

A JUNKED car flywheel, crankshaft, and cam-shaft, combined with a bit of welding, produced this mount for a leg vise. The flywheel and crank-shaft were left bolted together.

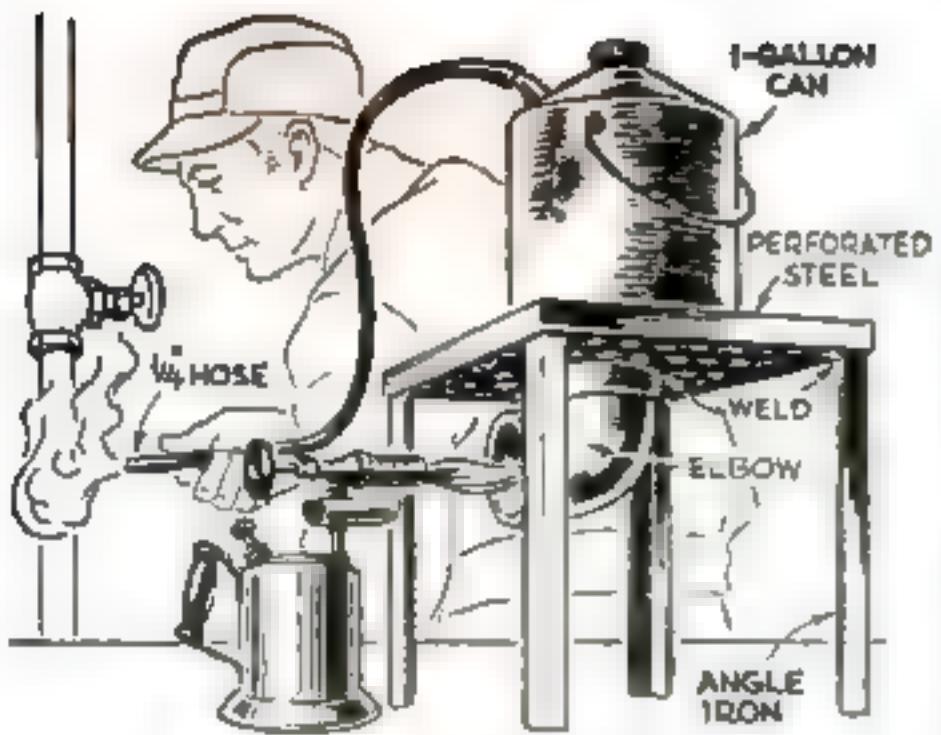
A small piece of boiler plate welded to the free end of the crankshaft provides a base for the vise. The camshaft was fitted into the leg socket of the vise to serve as the leg; the other end was welded to the flywheel. A piece of steel strap welded between the two shafts at a convenient mid-point adds to the rigidity.

At 170 pounds the mounted vise is quite stable, yet it can be tilted and rolled on the flywheel rim like a barrel. The various surfaces of the crankshaft provide an assortment of anvils and fixed dollies for bending and shaping.—*Robert T. Marshall, Emmitsburg, Md.*

Clamp-On Machine Light Quickly Attaches Anywhere

THERE'S almost no place in a shop where this work light wouldn't be useful. It was made by welding a cheap C clamp to a pipe tee and screwing the tee to the stem of an old swivel-shank machine light. Before assembly, the lamp cord was run out through the side opening of the tee. The clamp makes it possible to attach the lamp to any tool or table.—*H. J. Gerber, Stillwater, Okla.*





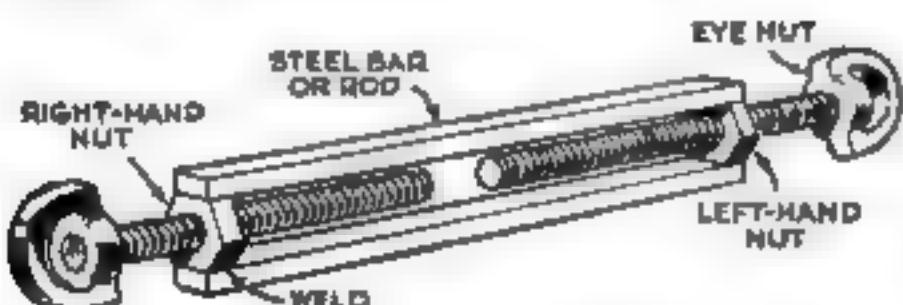
Low-Cost Pipe-Thawing Outfit

THAWING frozen pipes is done quickly and safely with a homemade steam-generating rig devised by the Department of Parks and Recreation in Lansing, Mich. The portable steam generator uses an ordinary gallon can with a hose slipped over the spout to carry steam to the thawing point. A table of perforated steel or steel mesh, with legs welded on, supports the can. A large pipe elbow conducts heat to the can from a blowtorch.



Emergency Pickaxe

THIS one was made by welding a short auto leaf spring onto the head of an old sledge hammer. I pointed one end of the spring for the pick and ground a blade on the other.—Harold D. Burgess, Battle Creek, Mich.



Making Your Own Turnbuckles

EXTRA-BIG turnbuckles are expensive and often hard to find. You can make your own turnbuckles to any length by welding steel bars or rods to large nuts. Use a left-hand-threaded nut and bolt at one end.—M. W. Loftus, Chicago.

Vise for Tying Flies

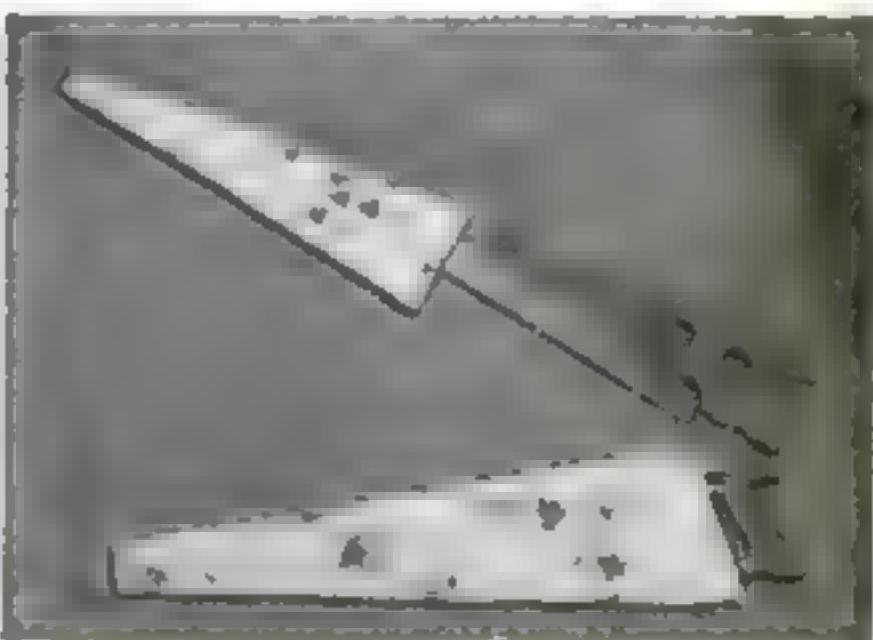
A SMALL drill chuck held in a vise makes an ideal vise for tying flies. A hook placed between two of the jaws will be tightly held when the chuck is locked.—Robert Micals, Freehold, N. J.



►►No shop in town could supply a tail-pipe extension for my foreign car, so I trimmed a chrome extension from an old vacuum cleaner to the length I needed. I drilled a hole in one end and turned in a bolt to serve as a lock screw when the tube was slipped over the tailpipe—Kenneth E. Philbrook, Dixmont, Me.

One Wife's Good Deed

I MADE these covers from heavy oilcloth for my husband's handsaws. They keep the teeth from being damaged by other tools. A loop of elastic slips over the saw handle to hold the covers in place.—Mrs. C. Wayne Close, Glendale, Ore.



First Turbine Fire Engine

[Continued from page 106]

faster than any of them. It'll do even better than that. It ran its test under a handicap that has since been removed: a rear-end ratio of 6.833:1. Its rivals all had the Department's standard 7.2:1 rear-end ratio when they made the climb.

Requiring no warm-up, the turbine job is ready to go full-tilt within 10 seconds after its driver jabs the starter button on the dash. Unlike fire trucks with piston engines, the Turbo Chief never requires choking, never runs the risk of vapor lock.

"Where we really expect it to delight us is in maintenance," said Chief Murray. "The Boeing people tell us that a couple of mechanics can overhaul the turbine engine in a day. It has only seven moving parts, I hear. Why, one of our reciprocating engines can be down as long as two months—and we end up with a bill of two or three thousand bucks."

Greatly reduced maintenance expense is expected to more than offset the premium price of about \$10,000 more for the turbine-powered pumper than for a conventional one. It cost San Francisco about a third more than a piston engine of comparable power.

It also consumes fuel about 50 percent faster than do any of the Department's conventional 330-hp. pumpers. But it burns low-priced diesel fuel or kerosene. The others use gasoline.

It never needs an oil change, for the lubricating oil does not get contaminated. There's no point where the hot gas comes in contact with it.

It's a simple engine. The Boeing gas-turbine engine has two main sections. The first develops the power. The second conveys it, through reduction gears, to a clutch and standard fire-truck transmission of five forward speeds and one reverse.

Each section of the engine has a separate shaft and its own turbine wheel. Though the two shafts are in line, there is no mechanical connection between them. They rotate independently.

Power is produced by burning a mixture of fuel and compressed air, and aiming the resultant torrent of 1,700-degree gas at the curved blades of the first turbine wheel. This turbine is on the same shaft as the impeller, which sucks

air into the compressor. As the driver of the Turbo Chief steps on the accelerator, the fuel flow increases, the first turbine whirls faster, and the impeller pulls in more air. This rising cycle spins the front shaft to a top limit of 37,000 r.p.m.

Meanwhile, a second turbine—the free power turbine—is motionless until the pumper's brake is released. Then the blast of hot gas streaming through the first turbine starts whirling the second one. Its spin is transmitted through 8.9:1 reduction gears to the output shaft, which has a top speed of about 3,200 r.p.m.

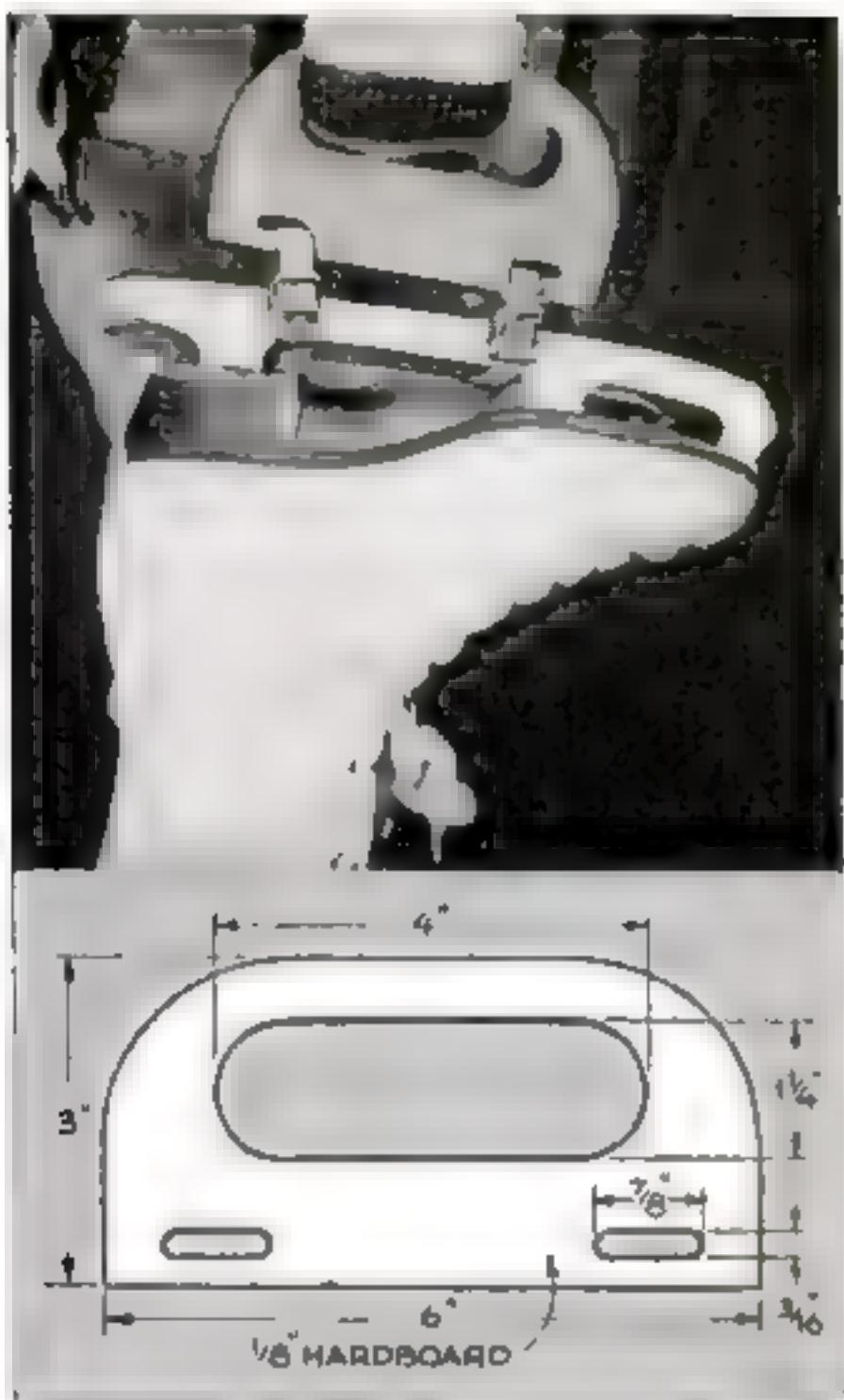
The second turbine. This one acts like a torque converter. When the Turbo Chief's driver brakes the pumper to a stop, the power turbine also stops. The driver doesn't have to touch the clutch. When he steps on the accelerator again, the flow of gas against the power turbine increases, and the vehicle moves ahead in the gear in which it was engaged when it stopped. The effect is as if the Turbo Chief had an automatic transmission.

On fairly level streets, third gear serves for all speeds up to 45 m.p.h. The two lower gears are for hills. The higher ones are reserved for freeway travel.

One interesting and valuable asset of the engine is that the relative velocity between the gas flow and the power turbine's blades increases as that turbine slows down. Torque rises steadily up to the point of stall. The engine gives its best performance at low vehicle speed.

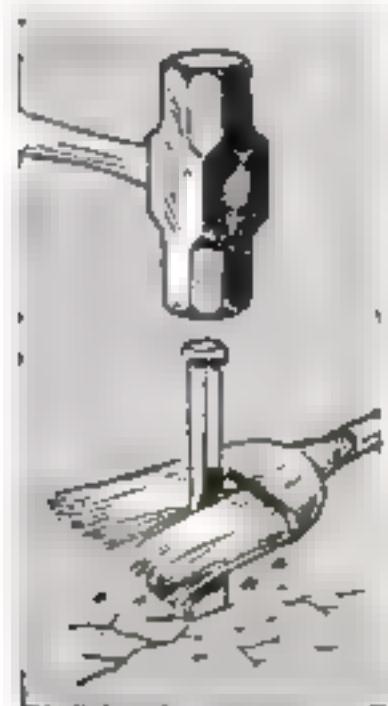
When the driver pushes the starter button, a glow plug is heated. As his finger leaves the button, the starter engages. With a rising whine like a bicycle siren's, it twirls the first turbine to a speed of 3,000 r.p.m. At that point the fuel solenoid opens and the glow plug ignites the fuel-air mixture. The engine comes to life with a deep-toned bellow, spinning the gas-producer turbine to 15,000 r.p.m., which is idle speed. The ignition and starter then drop out. From there on, combustion is continuous, and there is no further need for electrical power.

The engine runs with so little vibration that drivers of the Turbo Chief have entertained admiring colleagues with the old trick of standing a half-dollar on edge on top of the engine compartment while the pumper is idling.



Handle Tames Ice Skates

YOUNGSTERS can carry ice skates without touching the cold and often muddy runners with this handle. It takes only a minute to jigsaw it from $\frac{1}{8}$ " hardboard. Straps looped around the runners and through slots in the handle hold both skates neatly together. When not in use, the skates can be hung on a hook.—*Arthur R. Tanner Jr., Poughkeepsie, N. Y.*



Broom Saves Banged Finger

HERE'S a safe and easy way to hold a chisel when you're breaking concrete or other hard materials. The broom keeps chips from flying and gives your helper a long handle so he can stand way back.—*Thomas K. Powell, San Simeon, Calif.*



Foot Wiper on Ladder Rung

WHEN using a ladder in damp and muddy areas, tie a roll of burlap around the bottom rung to serve as a foot wiper. It will prevent a lot of dangerous slips caused by muddy feet.



Unclogging Files with Alcohol

TO PREVENT a file from clogging when you're working soft aluminum, keep it wet with alcohol. The file will last longer and cut more cleanly this way.—*Martin D. Koehler, River Grove, Ill.*

The Tool for



Bending

WIRE bending has always been an artistic delight but a mechanical headache. Now there's an inexpensive forming tool that gets rid of the headache. Your imagination is left free to create an endless variety of useful and decorative objects.

The bender consists of a small metal block with posts around which the wire is curved and a cam-action handle to apply the leverage. It can be clamped in any vise. Slip in a wire, give the handle a pull, and a sharp bend is made in one stroke. By taking a series of small "bites" with the handle, you can turn out smoothly curving arcs and circles to any radius.

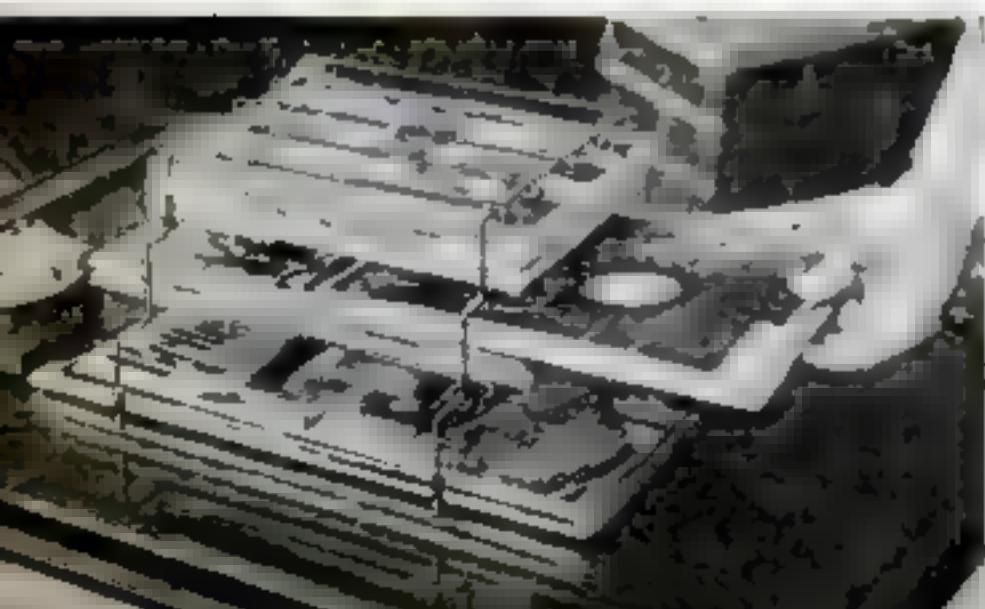
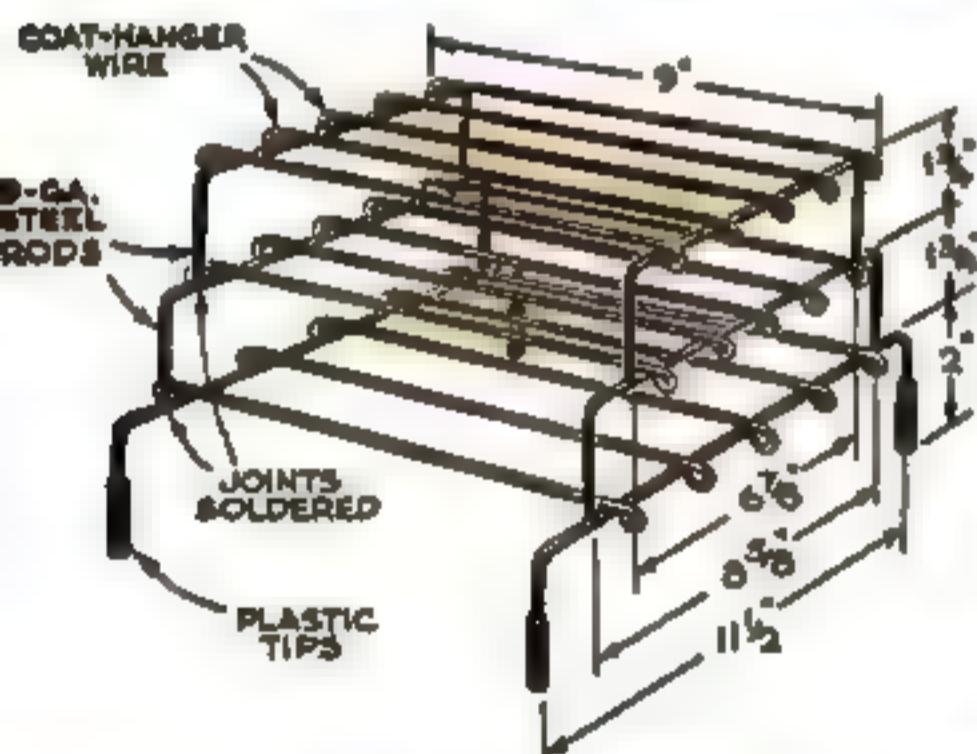
The tool will handle any size wire or

rod—aluminum, copper, bronze, or steel—up to $\frac{1}{4}$ " in diameter. A notched cutter snips the metal to length.

Tiny closed eyes, hooks, graceful spirals, and other intricate shapes take only a few minutes to form. By combining various types of bends in different directions, you can make racks, stands, fixtures for perforated board, furniture legs, letters for signs, chain links, and wire sculpture.

One ready source of wire for the bender is the common metal coat hanger. In most homes these are in oversupply. Coat-hanger joints can be soldered easily, but remember first to scrape off the paint at the joint. Welding-supply shops sell $\frac{1}{8}$ " steel or bronze rods in 3' lengths.

The bending tool, called Wireformer, is sold for about \$3 by the Vinkemulder Mfg. Co., 917 Princeton Blvd., S.E., Grand Rapids, Mich.

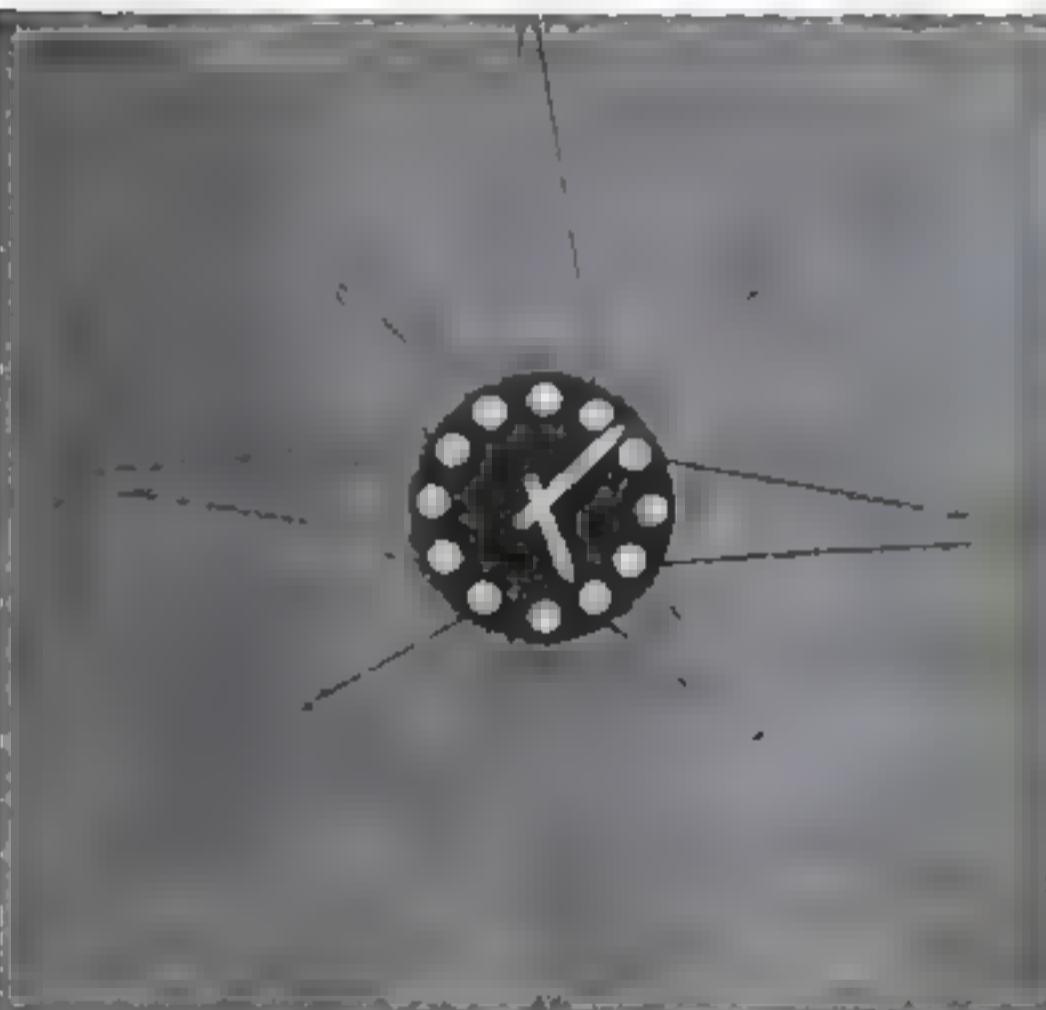
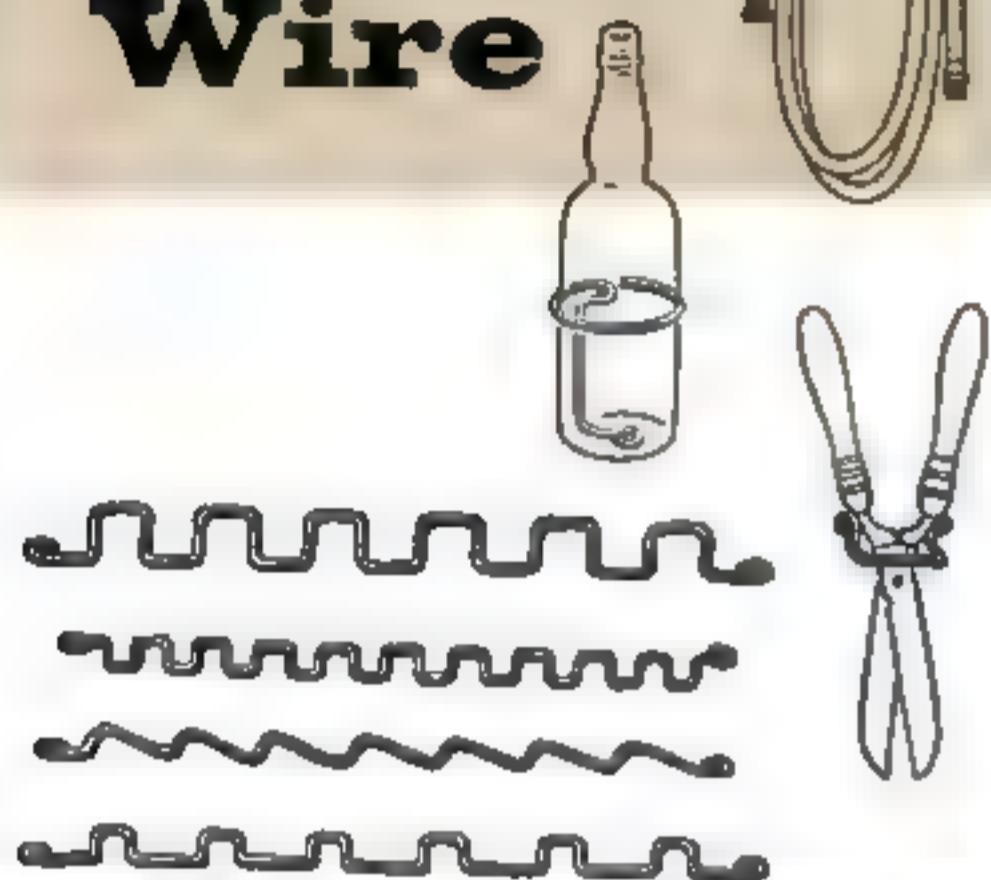


KIDS' TV BENCH is easy job—redwood slab and legs of steel rod bent and inserted in holes.

MULTI-DECK MAGAZINE RACK is one of many eye-catching designs. End supports are nine-gauge wire soldered together. Cross pieces come from ordinary wire coat hangers.



Wire



SUNBURST CLOCK: Rays are bent 12" and 24" aluminum rods, dial an 8" disk of $\frac{3}{4}$ "-thick wood painted black, hour markers knockouts from electric service boxes, the hands thin wood.

A RACK FOR CUPS or glassware like this one requires just two 24" lengths of steel rod.

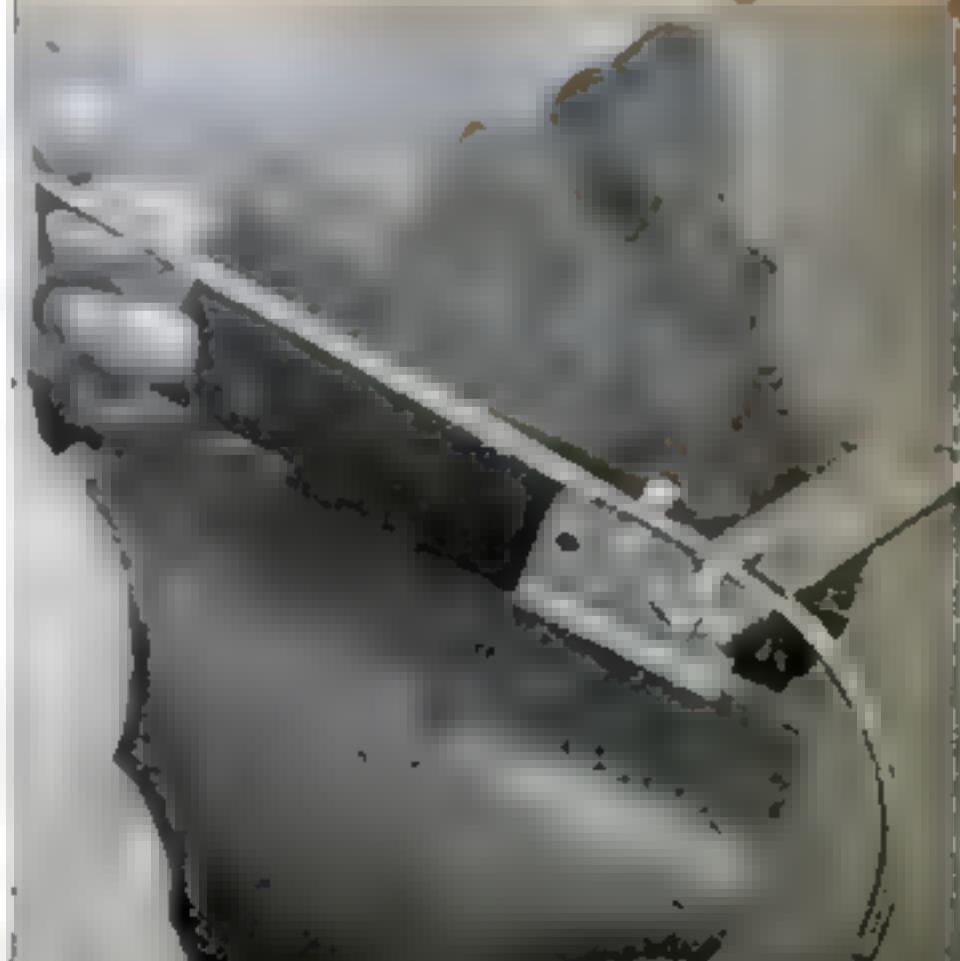


HOW IT WORKS: Tool shapes wire or rod between pins on the handle and a pin on the base. Turning handle clockwise produces right-hand bends; counterclockwise, left-hand bends.

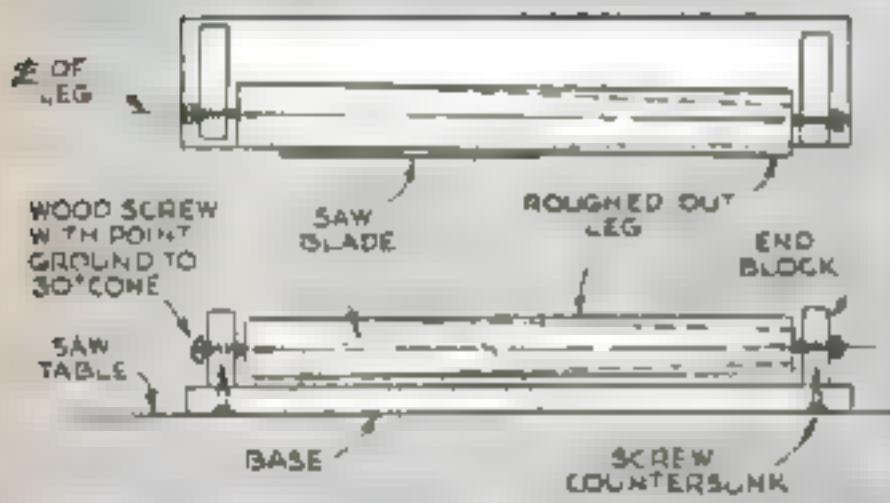
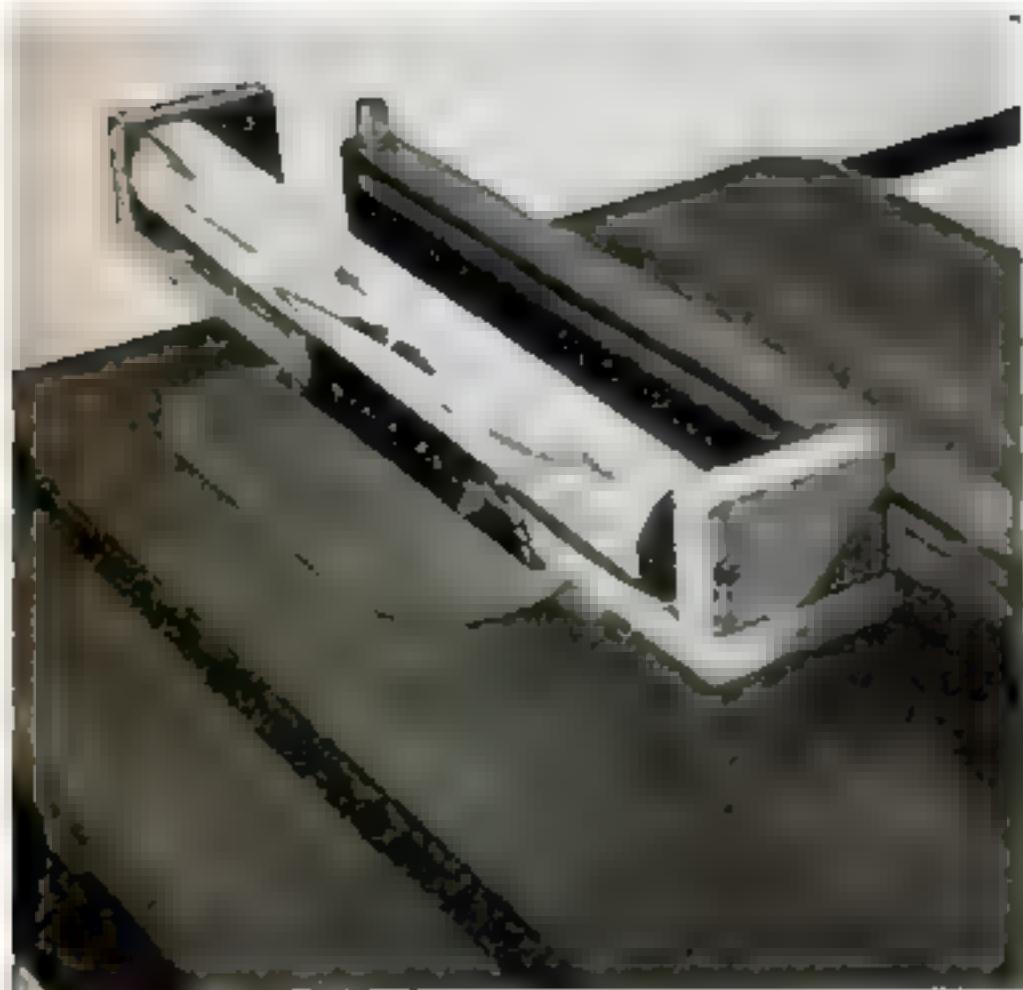


TIGHT BENDS can be made with inside diameters as small as $3\frac{1}{16}$ ". Tiny eyes like this make it easy to mount wall brackets. Notch at right side of the bender holds wire for cutting.

GRACEFUL CURVES are made by bending the wire a little at a time. Clip, stored in handle, fits over posts to handle very small wire. Hole in base holds cut ends steady for filing.



New Twist on an Old Jig



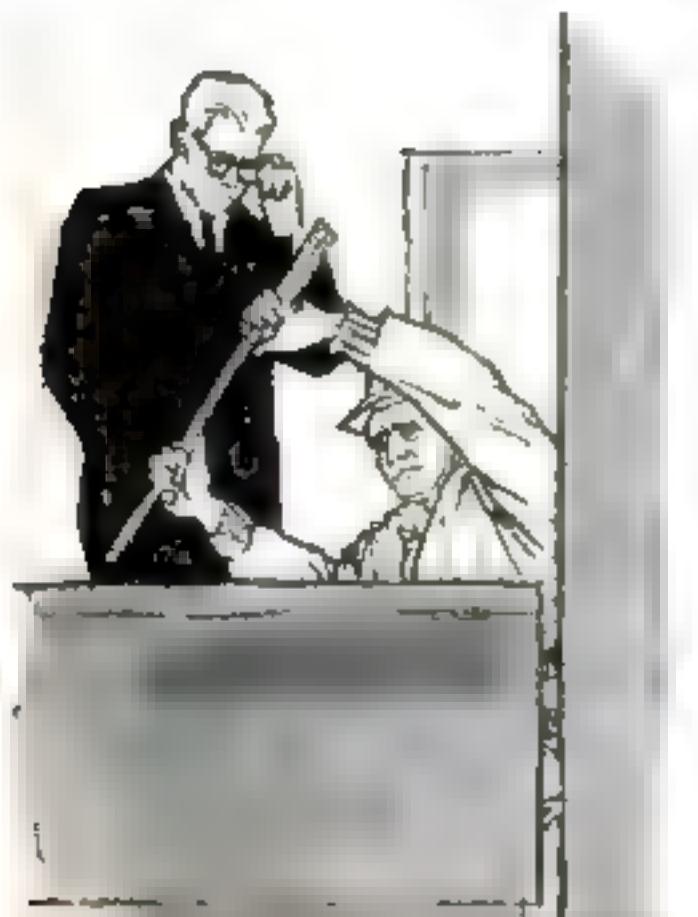
Using this modified taper jig on a table saw, you can cut straight or tapered legs of triangular, square, or hexagonal shape. From a hex leg, it's a simple matter of making a few more passes to trim off the hex corners, and produce a round leg without using a lathe.

Differing from the familiar jig used for tapering flat boards, this one operates in two dimensions, permitting you to rotate the work after each pass over the saw blade. Make the base from $\frac{1}{2}$ " plywood, 4" wide and about $2\frac{1}{2}$ " longer than the legs to be shaped. Screw two $\frac{3}{4}$ " end blocks to the base, setting them at a slight angle, depending on the taper.

Before mounting a leg in the jig, rough cut it to $\frac{1}{8}$ " of finished size by ripping off the corners on the saw. Punch-mark the center of the leg at each end. Mount the leg between the screw centers in the jig, tightening them enough to keep it from rotating. Raise the saw blade to cut about $\frac{1}{4}$ " above the leg's center and set the fence to bring the leg to finished size.

Slide the jig along the fence to make the first cut, then loosen the center screws and give the leg a one-third, one-quarter, or one-sixth turn, depending on the desired shape, and make the next cut. To make a round leg, rotate the work in small increments and make repeated passes until it is round enough to be sanded to final shape.—*Earl L. Manor, San Diego, Calif.*

My Most Embarrassing Shop Moment



I SET the chest in place and stepped back to admire it. I had made it of costly high-grade hardwood to fit precisely inside one of my neighbor's dormer windows.

To my horror, the chest had shrunk. Although its dimensions checked perfectly with my rule, it was exactly 1" too short, 1" too narrow, and 1" too shallow.

Then it hit me. The tip of my rule had broken off earlier and to avoid discarding the tool—unthinkable to my thrifty nature—I had cut off the end to the 1" mark, always adding the missing inch mentally. Always, that is, until this time. I've never forgotten this expensive lesson: It doesn't pay to save money with faulty tools.—*Maxwell W. Flesher, Huntington, W. Va.*

.....

Do you have a shop blunder that haunts you? PS Will pay \$50 for each such experience published. None can be returned. Keep it brief. Address: Shop Editor, Popular Science Monthly, 355 Lexington Ave., New York 17, N. Y.

So You've Invented Something

[Continued from page 124]

tors Council) replied no, they didn't see any great advantage over diggers already on the market.

A few were interested in a closer look. To each of them Kessler sent a "folio": a folder containing a photostat of the patent, photographs of models, and a discussion of the merits of the machine.

This brought more than a nibble. Roper Manufacturing Co. had a contract to equip a fleet of jeeps for shipment abroad, and the Cannon digger was the accessory they were looking for. Cannon didn't get rich (on this invention, anyway), but he did clear several thousand dollars in royalties.

Another way is to set up your own business

The biggest returns (and risks) await the inventor who goes into business for himself.

Dr. David Richman gave up dentistry (after an automobile accident) to sell plastic swimming pools in Florida. Then he contrived a gun that sprayed fiber-glass onto pools, boats, and molds. Two years ago he set up shop in a concrete-block building in Hialeah, investing \$3,000 of his own money and raising \$10,000 in small bites.

The gun is an efficient tool. Dr. Richman is a powerful salesman. He sold 100 units. At around \$4,000 each, that's good enough to interest Wall Street. Now the underwriters have floated \$250,000 worth of stock to enable Spray-Bilt Inc. to expand its business. Dr. Richman's original \$3,000 stake is worth close to \$100,000, on paper anyway.

Only a going concern can expand by selling stock to the public. You have to get started on money raised privately.

Maxwell Mangold, the chunky, fast-talking Wall Streeter who set up Spray-Bilt's stock issue, explains where to find that dough. Look to lawyers and accountants, he advises. They can introduce you to well-heeled citizens.

Why investment dollars sometimes come easy

The fat cats are ready and eager to ante up because of the way the Federal

income-tax laws are rigged. Uncle Sam plays heads-I-win-tails-you-lose with high-bracket taxpayers—and willingly takes the short end.

Take Mr. Gotrocks who earns so much money he is in the 80-percent tax bracket. If he socks \$10,000 of income in the bank, Internal Revenue will demand \$8,000 of that nice round sum.

Suppose instead he invests the 10 grand in your invention. Maybe the invention, a power-operated buggy whip, proves not very commercial. Old Gotrocks deducts this \$10,000 loss from his tax return—and is out of pocket only \$2,000.

But the sweet part appears if your invention is a never-dulling razor blade, and really takes off. Gotrocks' investment could easily double in value. His \$10,000 profit would be a capital gain, taxed at only 25 percent. Now he can keep \$7,500. This deal works fine for everybody: The inventor gets capital, the Government covers most of the losses, and the investor gets to keep most of his profits.

How much can you make if you're lucky?

Bendix paid \$649,000 plus a percentage for James Rand's patents on the Economat washing machine (the one that squeezes clothes inside a plastic bag). Only an old pro like Rand can drive that kind of bargain; ironically, the machine never caught on, and Bendix later sold out its appliance business.

A more realistic deal is an initial payment—often \$500 to \$1,000—against a royalty of three to five percent (on selling price).

If you beat the bushes for backing for a company of your own, you quickly find out that it won't be your personal company. The investors and their managers expect an 80- to 90-percent share of the new firm. They take a big risk, and shoulder 80 to 90 percent of the responsibility for ultimate success.

The inventor's cut may seem small, but it can turn out to be a nourishing slice. George Nelson's piece of Stud-Welding Corp. was just 20 percent. Twenty percent of \$15,000,000 is \$3,000,000.

What's Coming In Outboard Motors

[Continued from page 131]

jection and a turbosupercharger. Specific fuel consumption of the experimental power plant is .055 lb. per horsepower hour, better than that of most four-cycle engines.

Current outboard compression ratios are in the range of 6.5-6.7:1. Power could be increased by increasing compression ratios. This has not been done as it calls for far more flexible spark-plug heat ranges than present plugs offer; and it would also lead to detonation problems. Superchargers, however, will give better performance and fuel economy.

Outboard fuel injectors will probably be of the unit cartridge type. A bellows device will change metering automatically with variations in altitude, eliminating changes in jet size. Metering compensation for changes in temperature will be accomplished by the use of a bimetallic element.

Vari-pitch props. You can expect other changes besides those in the power head. Controllable-pitch propellers are coming,

to get maximum thrust under varying loads and conditions. Though a remotely operated controllable-pitch prop is complicated and expensive now, we should see them within the next five years.

Present control cables for throttles, shift, and some steering mechanisms lash around with motor movement. This leads to stiff operating, jamming, and breakage. Simplified disconnect linkages will be provided so that casings of push-pull controls will remain stationary regardless of power-head movement. We can look, too, for the power heads on big motors to become fixed with only the lower unit pivoting for power steering.

Remotely operated hydraulic controls will be provided for both motor-angle and transom-height adjustments. Additional instrumentation is coming, too. Water-pressure pickup tubes will be cast into lower units, and speed-meter connections will be provided at the top of the power head. Engine heat indicators and tachometers will also be standard.

A Steam Turbine for the Savannah

[Continued from page 141]

Check all fittings for steam leaks and time the duration of the run—it should be close to half an hour.

You must add ballast to the ship before installing the power plant. Sheet lead—the type used for flashing and electrical work—is best because it can be placed flat on the bottom of the hull for maximum weight at the lowest point.

Cut a piece 6" wide by 22" long and trim it to fit the hull. Cement it in with auto body filler or other metallic cement. Next, fold about 2½ pounds of the lead into a block about 3" by 4" to substitute for the weight of the radio-control receiver we'll describe next month. Should you decide not to install the radio control, the weight can be cemented in permanently to keep the ship trim.

Make the trim test before permanently installing the parts. Place them in the hull, put on the superstructure, and try the ship in a bathtub or wading pool to see how it floats. Shift the boiler and the lead block forward or aft, if necessary, to make the ship float on its waterline. A slight list of the model can be corrected by placing a few ounces of lead on the

high side to balance the hull properly.

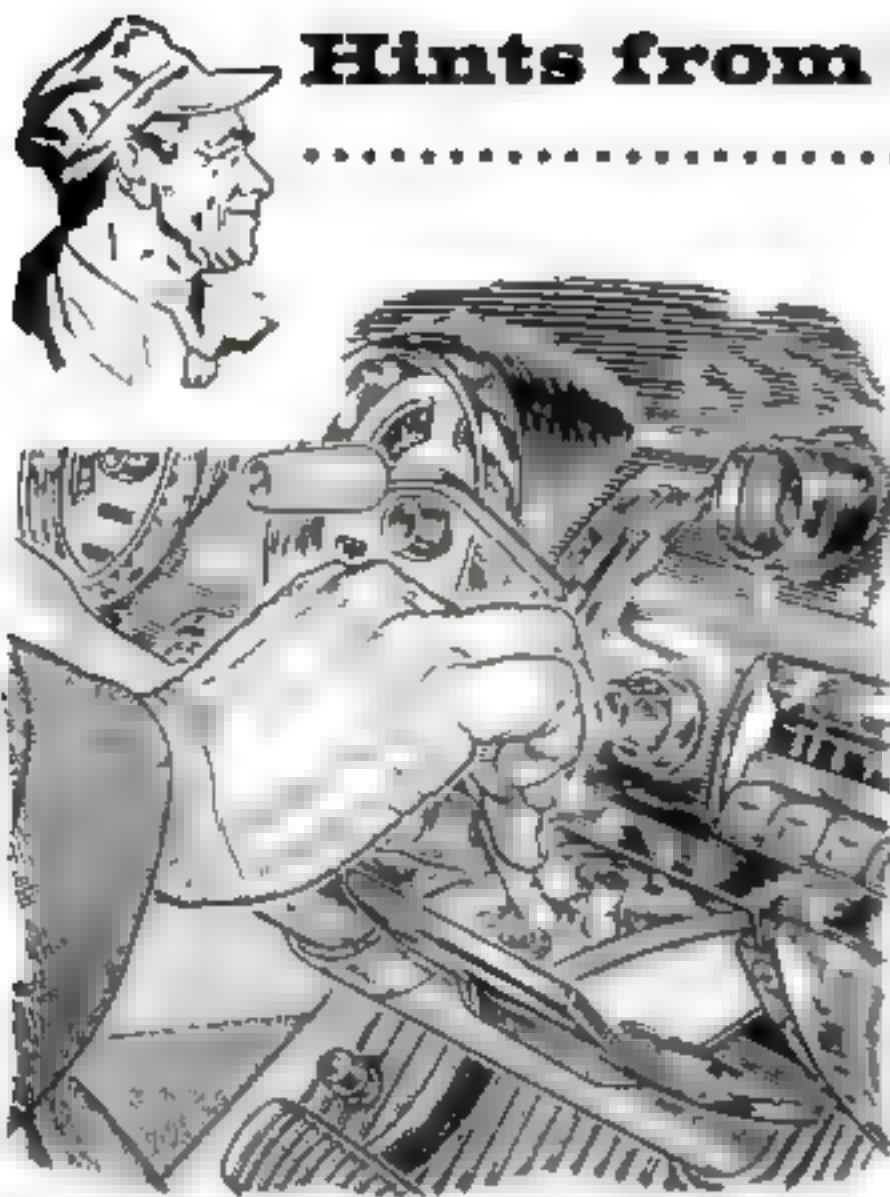
When you get the ship riding level and at the right height, mark the position of the power-plant parts and the lead weight and return to the bench.

Cement $\frac{1}{2}$ "-square strips of wood across the hull bottom to support the boiler and gear-reduction unit. When the cement sets, screw these parts in place. The lead blocks can be fastened in position temporarily with masking tape. An effective flexible coupling between the gear output shaft and the propeller shaft can be made by soldering two collars on a close-wound coil spring about $\frac{1}{4}$ " in diameter. Fasten the coupling to the shafts with a setscrew in each collar.

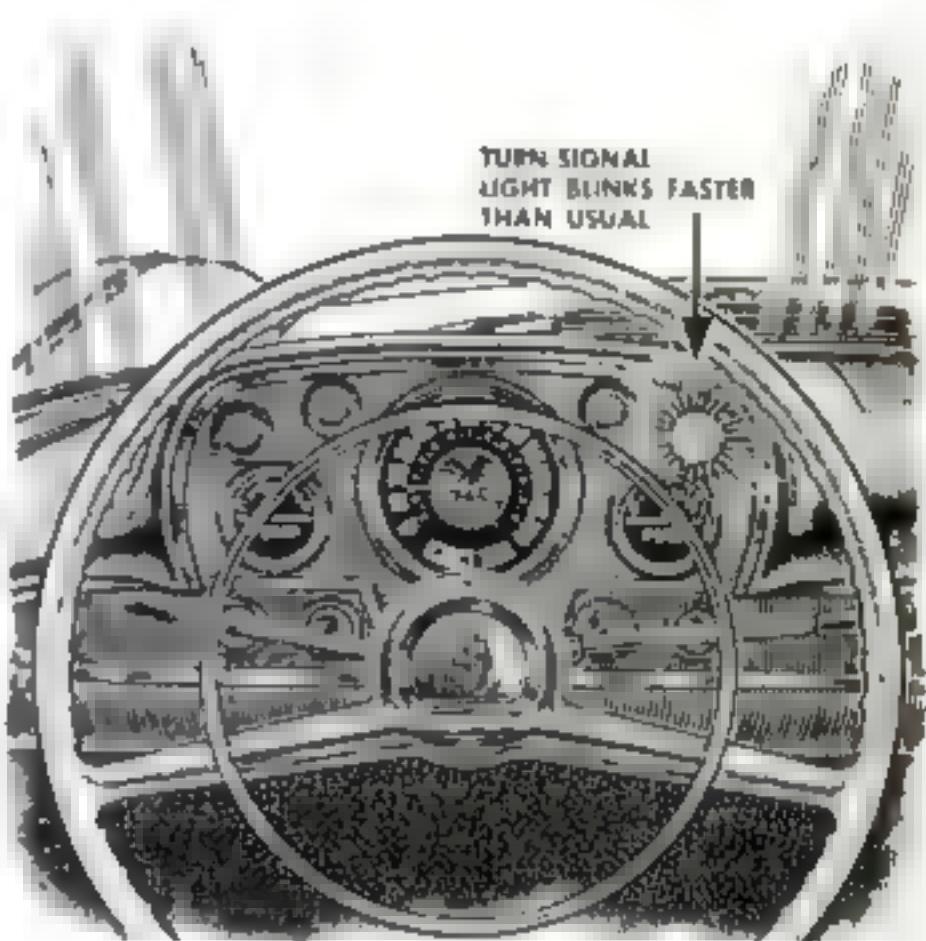
If the ship rolls or the water is rough, plug the lower row of portholes with putty to keep water out.

Lock the reverse idler in forward position and center the rudder to run point-to-point trips across a pond or pool. Seeing the model cutting a wake under her own steam is a sight to behold, but the big thrill comes next month when, by radio control from shore, you really take over as captain.

Hints from the Model Garage



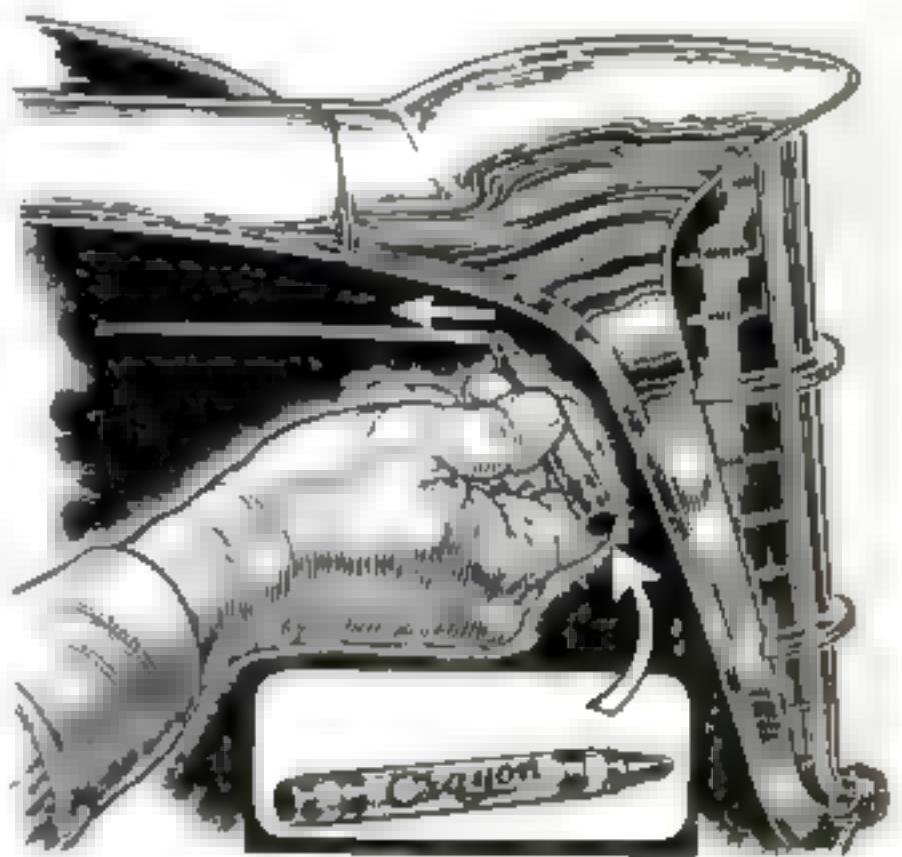
Snuff out cigarette butts safely, without taking your eyes off the road, this way: Put about $\frac{3}{4}$ " of sand in the ash tray. A butt will be smothered quickly when pressed into the sand, and it can't ignite other butts in the tray.



Turn Indicator blinking too fast? Check your bulbs. An indicator light that blinks more rapidly than usual is the tip-off that a bulb on that side has gone out. Replacing the bad bulb will restore the indicator to its normal blinking frequency.

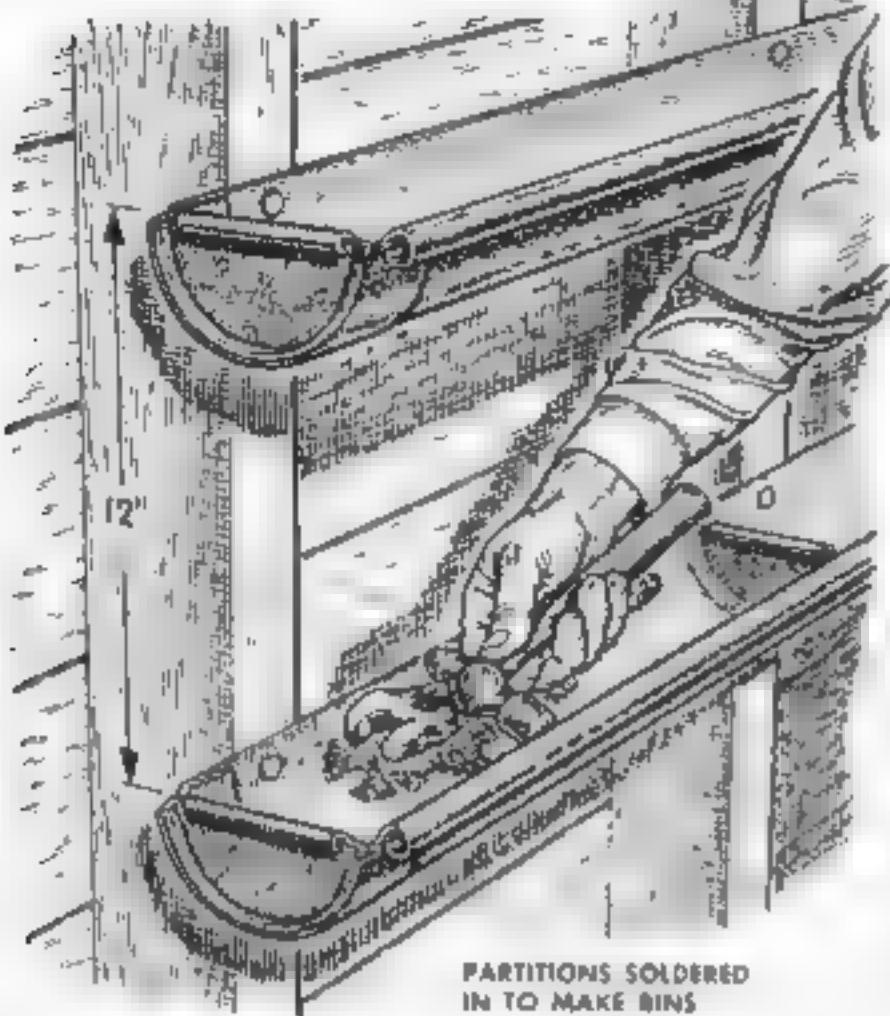


Long-burning road flares can be made by filling empty wick-type room deodorizer bottles with kerosene. When needed, unscrew the cap, pull out the wick, and light. Tightly capped bottles can be carried safely in a box in the trunk.

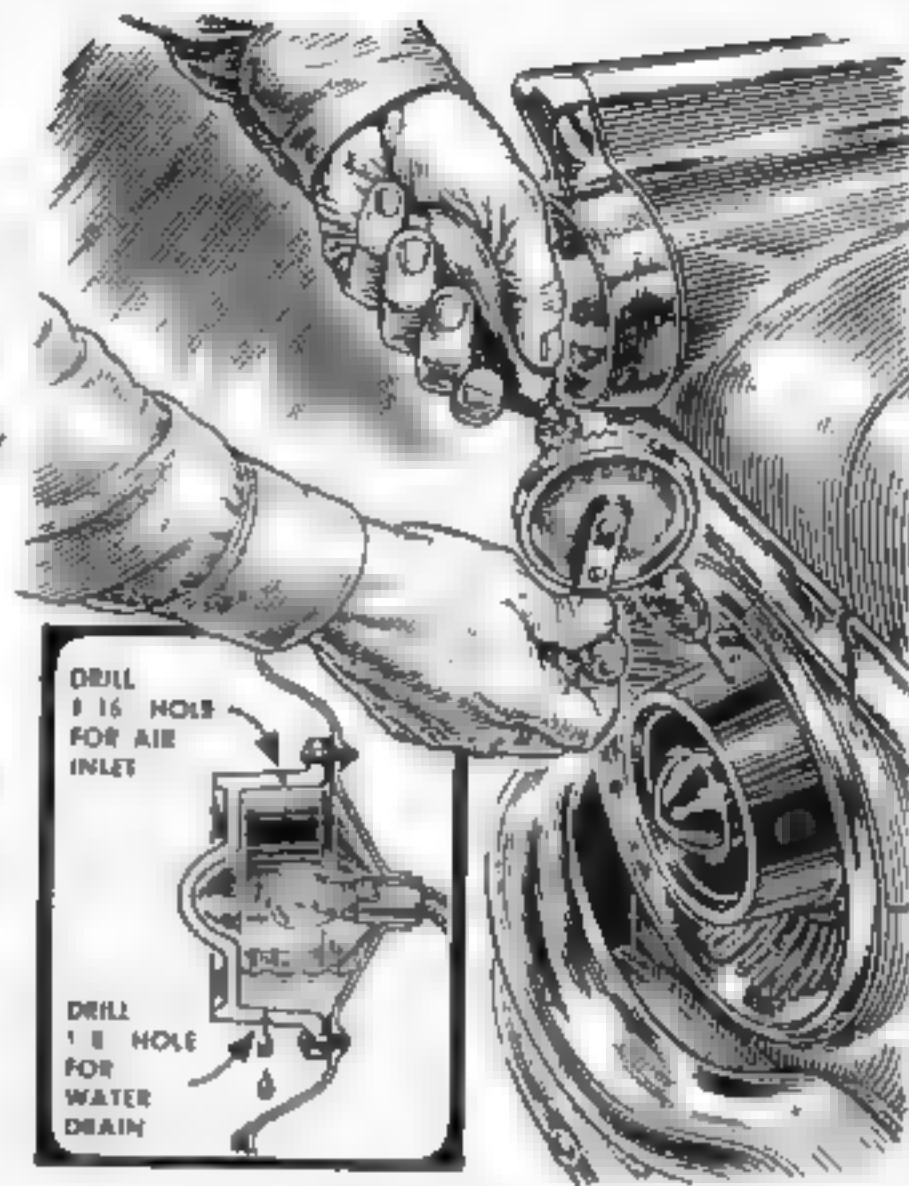


Touch up small scratches or paint chips with a school crayon of matching color. Rub the crayon over the scratch until it is filled. Then polish the area with a soft cloth to blend the crayon wax in with the surrounding car finish.

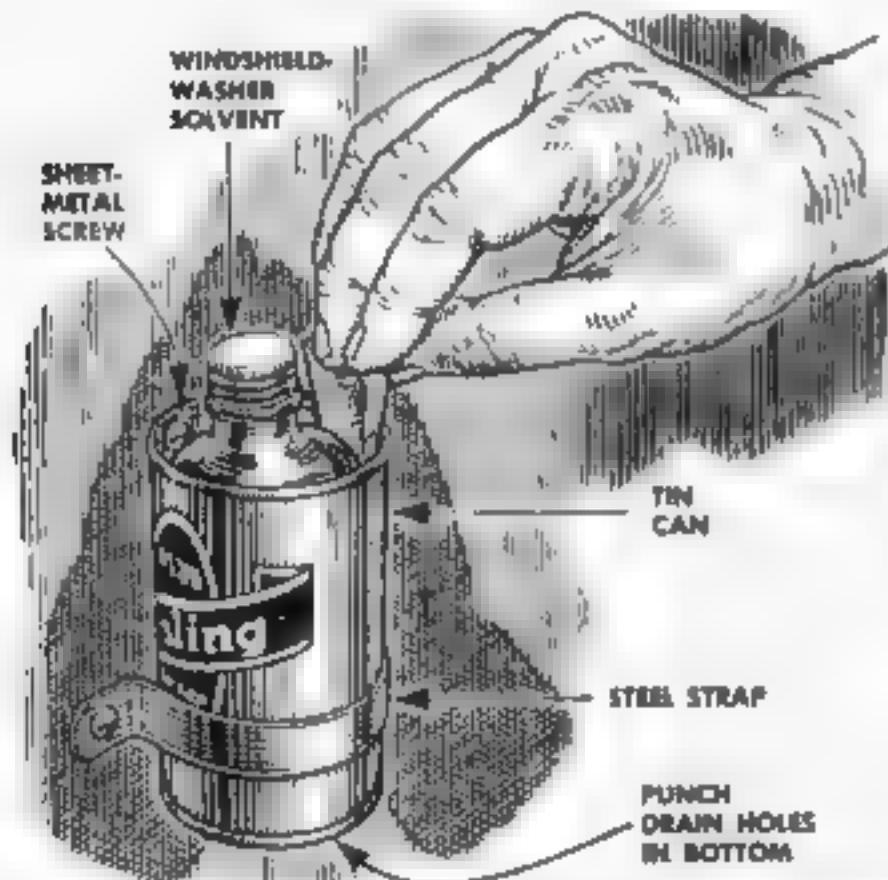
More Hints from the Model Garage



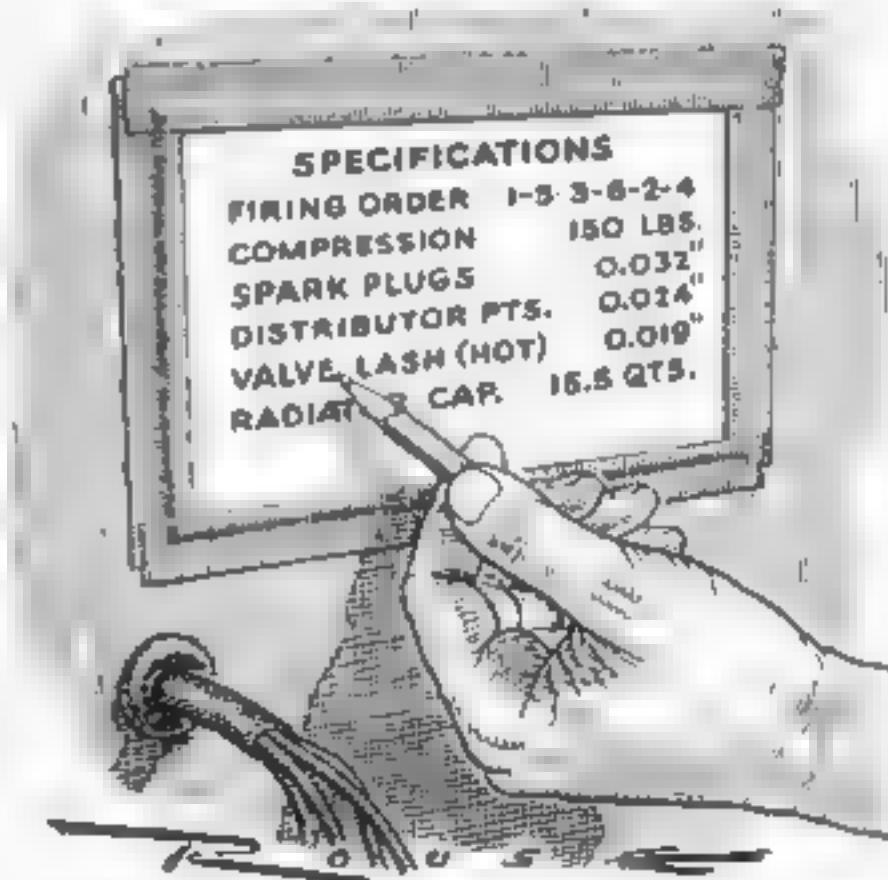
Handy storage bins for nails, screws, and small tools can be made from aluminum or galvanized steel gutters. Nail the gutters to the wall, one above the other. Use metal end caps to close the ends and to form partitions between the bins.



Rain water often accumulates inside the big tail-light lenses on modern cars. Locating and sealing off the spot where water enters isn't easy, but providing a drain is. Just drill two holes, as shown above, to let water out and air in.



Windshield-washer solvent can be stored beside the washer reservoir by fastening a tin can inside the engine compartment with sheet-metal screws. A strip of sponge rubber slipped between the bottle and can will prevent annoying rattling.



To save going through the shop manual each time you tune up or adjust your car, type all basic specifications on a card, cover it with clear plastic, and tape it to the firewall. The information will be helpful to your repairman, too.



406.6 m.p.h.* Mickey Thompson sets a one-way land speed record at Bonneville
in his Champion-sparked Challenger 1

Spark your car with Champions— the plugs that powered the world's fastest car!



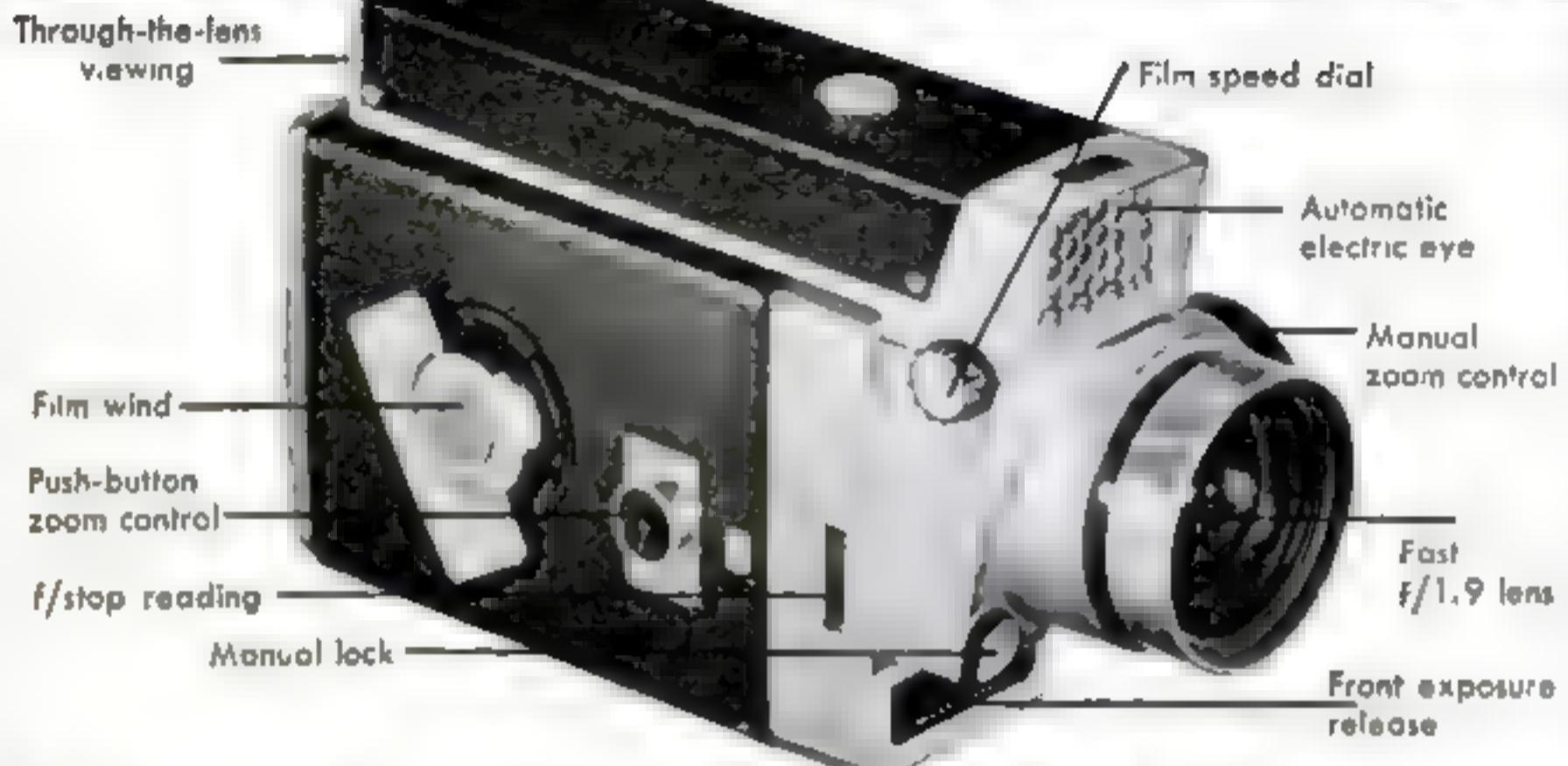
Over twice as many car makers specify
Champions for top performance. Above:
Champion-equipped Ford Thunderbird.

Men who shoot for new records know they have to squeeze every bit of performance out of their engines. They demand efficiency and full-firing power. That's why they choose Champion spark plugs. Put a new set of Champions in your car every 10,000 miles. They'll deliver all the performance built into your engine . . . and they'll save money on gasoline!

CHAMPION



New Ideas in Photography



New Electric-Eye Camera Lets You Make Zoom Effects with Push-Button Ease

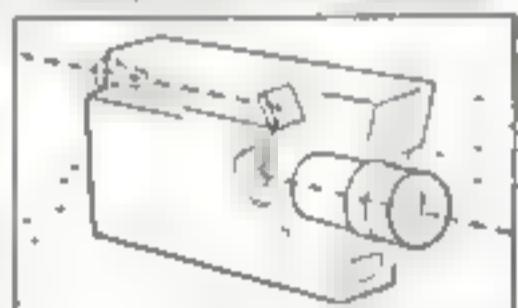
With the new Kodak Zoom 8 Reflex Camera, one button operates the camera and zooms the lens. Push down and the lens zooms automatically for a screen-shaking close-up. Push upward for a wide-angle view. Zoom in or back—not a second of action is lost. And you see it all, right in the viewfinder, just as it will appear on the screen.

This remarkable 8mm camera also lets you follow the action without stopping to adjust exposure. A built-in electric eye sets lens to changing light conditions automatically. For special lighting effects, you can lock the

meter at any shade of exposure that you wish.

Move in as close as 18 inches, using Penta Lens attachments. There's no "hard corner" since you view through the lens—*the diagonal*.

Priced at less than \$200, the Kodak Zoom 8 Reflex Camera (Automatic f/1.9) can be yours for as little as \$20 down. See your Kodak dealer for exact retail price.



New Sound Projector Can Turn All 8mm Home Movies Into "Talkies."

Would you like to add voices, music, sound effects to your 8mm movies—old or new?

It's easy—with the new Kodak Sound 8 Projector. Have Kodak Sonotrack Coating added to your edited film. As you project this film, record your comments, using the microphone that comes with the Sound 8. To add music, connect your phonograph or tape recorder. Immediate playback. To make changes, merely re-record. Recording head is made of Alsenol, ultra-durable new alloy. Kodak Sound 8 Projector shows films at 16 or 24 fps.



New Kodak Sound 8 Projector—less than \$350

from Kodak

One-Billionth Horsepower Controls Exposure in Automatic Cameras

Imagine a rating of 1/1,000,000,000 horsepower. At Kodak, it's jokingly called "oatpower." Yet one "oatpower"—generated by the photocells of Kodak automatic cameras—insures correctly exposed snapshots, slides and movies.

Each photocell is composed of a thin steel plate coated with layers of selenium, cadmium, and gold or platinum. The last layer is about one molecule thin, and is covered with lacquer to seal out moisture.

Works this way. When you aim a Kodak automatic camera, light from the scene falls on the photocell and is converted into electric current. This generates the power that operates the balanced meter mechanism.

The position of this mechanism determines the lens opening. On a sunny day, when you press the shutter release of a Kodak automatic still camera, the lens "squints." In the shade, the lens opens up.

With Kodak automatic movie cameras, the lens opening adjusts continuously to changing light conditions.

See your Kodak dealer. He can help you choose the automatic camera that best fits your needs from those shown at the right.



These bearing pins are from a Kodak electric-eye system. They have the same .001 points as the LP phono needle shown with them. So precisely balanced is the system that a human hair can be used to move the meter needle through its full range.

Picture it now... enjoy it again and again

EASTMAN KODAK COMPANY, Rochester 4, N.Y.

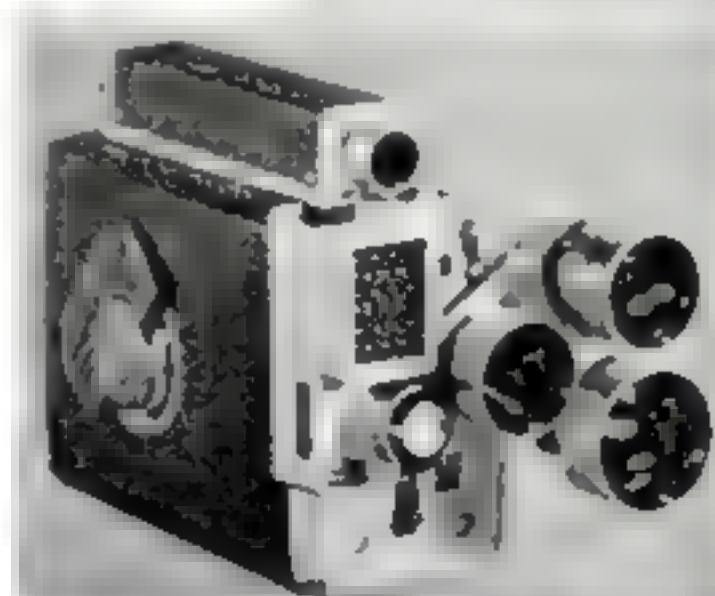
See Kodak's "Ed Sullivan Show" and "Adventures of Ozzie and Harriet."



Brownie
Starmatic
Camera,
less than
\$30.



Kodak
Automatic 35
Camera,
less than
\$90.



Kodak Cine
Automatic
Turret
Camera,
f/1.9, less
than \$125.



Brownie
Automatic
Movie
Camera, f/2.3,
less than
\$78.

Prices are subject to change without notice.

Kodak
TRADEMARK

NEW OAK FLOORING LAYS LIKE TILE over concrete, wood or old tile floor



Bruce Laminated Oak Block

Modernize your home by installing this beautiful hardwood floor over your old floors. Or use low-cost Bruce Laminated Blocks to create new living space in attic, basement or addition.

Easy to lay — Just apply adhesive (Bruce Everbond Coldstik) and lay blocks. Tongues and grooves assure tight fit. No nailing...and no sanding or finishing either, because Bruce Laminated Blocks are completely prefinished at the factory. Your new floor is ready to be used and admired as soon as you lay it.

Moisture-resistant — Blocks are 9" square and only $\frac{1}{8}$ " thick. The three oak plies are laminated under heat and pressure with waterproof glue to prevent expansion and contraction. Ask your lumber dealer for a cost estimate. Mail coupon for color literature on Bruce Laminated Blocks.

SEND FOR COLOR FOLDER

F. L. Bruce Co.
Box 397-B Memphis 1, Tenn.
Send complete information on Bruce
Laminated Oak Block Floors.

Name _____
Address _____



Bruce LAMINATED Oak Block Floors

By the world's largest hardwood flooring maker

Answers to PS Puzzlers on 18 and 20

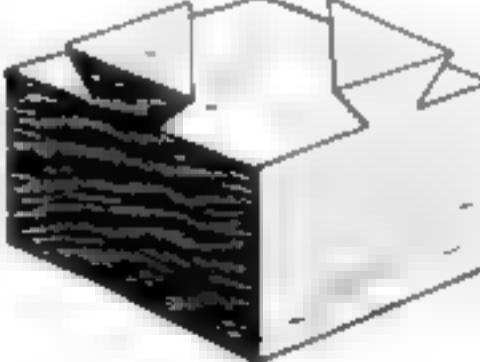
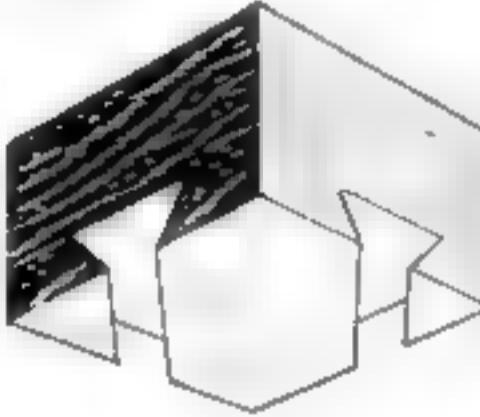
Pigs-in-sties. Put 8 pigs in the first sty, 10 in the second, nothing in the third, and 6 in the fourth. Ten is nearer 10 than 8; "nothing" is nearer 10 than 10; 6 is nearer 10 than nothing; and 8 is nearer 10 than 6.

Infinite snowflake. Yes—the curve length grows indefinitely. (Mathematically, its limit is infinite.) Here's what happens:

At the first step the curve was one unit long. But at step 2 we got four segments each $\frac{1}{3}$ unit long—a total of $4 \cdot \frac{1}{3}$ units. At step 3 we got 16 segments each $\frac{1}{9}$ unit long—a total of $16/9$ units long. It's easy to see that after 1, 2, 3 . . . n steps, the curve length is $1, \frac{4}{3}, (\frac{4}{3})^2, \dots, (\frac{4}{3})^{n-1}$ units. Since $\frac{4}{3}$ is a number greater than 1 it's obvious that by choosing n large enough, the number $(\frac{4}{3})^{n-1}$ can be as big as we like. (It takes only 49 steps to get the curve length over a million units.)

No-pencil quickies: 1. Only four squares. 2. You're going to hate me for this: The answer is anywhere—except the poles—if you walk backwards. 3. The bat coat 75 cents, the ball 50 cents.

Woodworking:



The two pieces slide together diagonally as shown above.

Insure your boating pleasure three ways—with Weldwood



Make waterproof repairs that last with
WELDWOOD RESORCINOL GLUE



Prevent rot and warp with
WELDWOOD WOOD PRESERVATIVE

Once your boat's in the water, you don't want to spend time working to keep her afloat; you want to enjoy her. So give your boat the attention she needs now. These three marine products by Weldwood® can help you do the job better—and do it more easily. They're sold at leading marine and lumber, paint, and hardware dealers'.

WELDWOOD WATERPROOF RESORCINOL GLUE is best for *all* boat repairs, *essential* for any below-the-waterline gluing jobs (it's *guaranteed* waterproof). Makes a powerful bond, resists fungus, rot, heat, oils. From \$1.15.

WELDWOOD WOOD PRESERVATIVE contains high potency 5% Pentachlorophenol and deeply penetrating oils. Prevents rot, mildew, warping; retards shrinking and swelling. From \$1.35.

WELDWOOD EXTERIOR CLEAR SPAR VARNISH gives a high gloss, clear finish, unexcelled for resistance to wear, discoloration, fungus, checking—even in severe conditions. From \$1.59.



Protect your boat's beauty with
WELDWOOD SPAR VARNISH



Products of United States Plywood

How the dip-stick spots engine trouble!

Does the dip-stick in your engine crankcase show up costly oil loss?

If it does, better have an experienced engine mechanic check your engine for bearing wear.

More than likely, he'll find that dropping oil levels on the stick are linked to poor engine performance. And here's why: once bearings wear beyond the engineered clearance point, oil pressures drop. Surplus oil splash goes wild. Uniform lubrication is lost. Excessive oil flies onto the cylinder walls. It is pumped into the combustion chamber where it burns into carbon. It fouls plugs. Deposits pile up on valves and piston rings. Rings cease to flex and menace compression.

Your mechanic knows the best method of correcting these troubles. You'll find in most cases he'll suggest Federal-Mogul engine bearing replacements to restore perfect performance.

Federal-Mogul engine bearings are the world's standard for quality. And world-wide distribution brings them as close as "next door" for leading imported and domestic car engine replacements.



FEDERAL-MOGUL SERVICE



Division of Federal-Mogul-Bearings, Inc. • Detroit 12, Michigan

New Gas Furnaces

[Continued from page 83]

The advantages of thermoelectric systems are clear. They can be smaller, more efficient, easier to install. (No separate electrical wiring is needed.) They have built-in reliability for emergency, too: They'll work when the power lines are down.

Infrared ceramics. The furnace that could make pools usable all year round—or eliminate the need for snowshoveling your driveway—is the Schwank Infra-Red Heater, sold by the Perfection Division of the Hupp Co., Cleveland. It is already in use in factories, foundries, and outdoor restaurants. Now smaller ones are available for homes. While the Schwank burner also heats by radiation, it differs sharply from the Pyrocore. Here it's the ceramic that counts. A powerful gas producer of infrared energy, the ceramic lines one side of the burner in a $\frac{3}{8}$ -inch-thick plate.

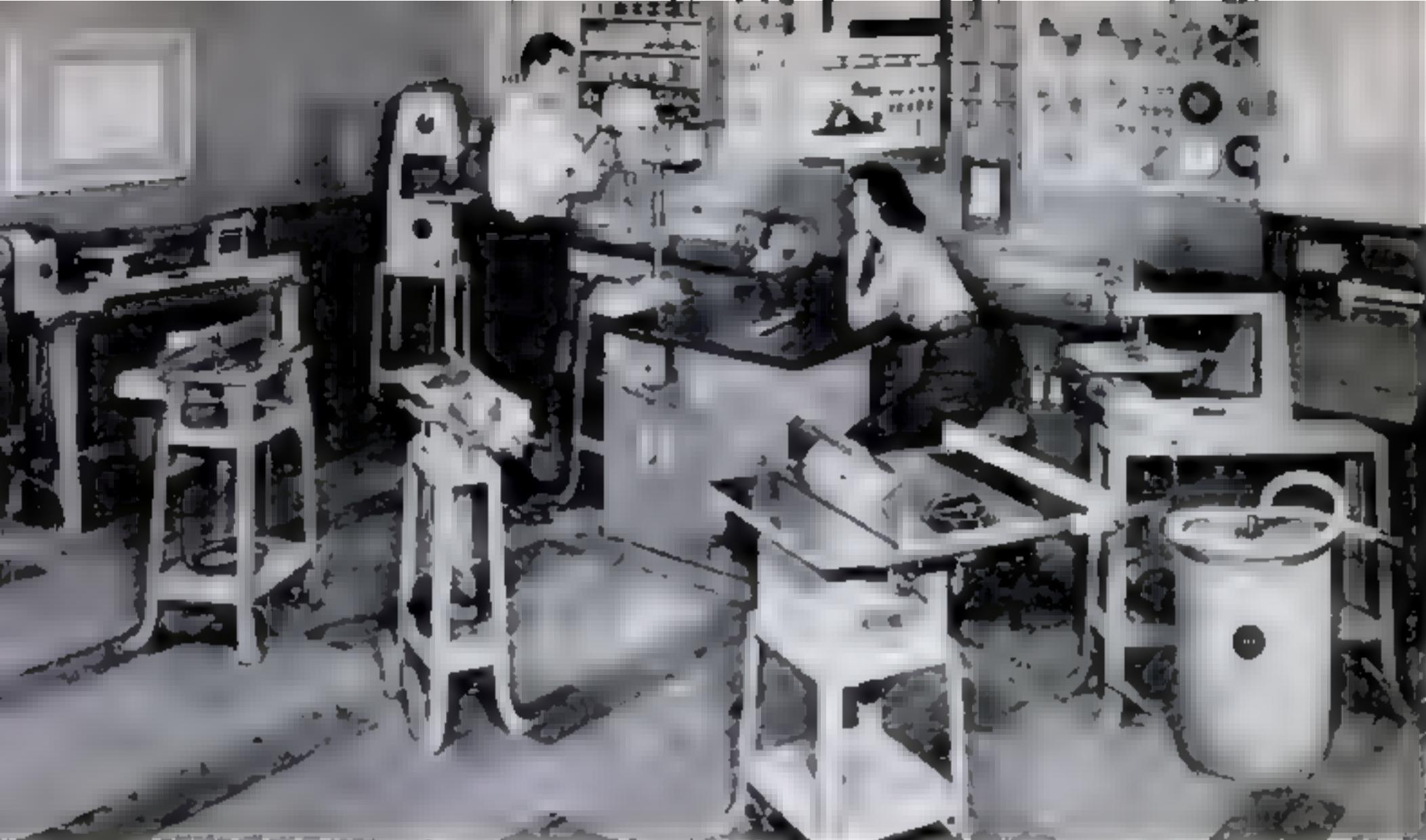
Honeycombing the plate are tiny holes (200 per square inch), which allow the gas-air mix to flow through and burn on the surface of the plate. At red-hot temperatures the ceramic then emits infrared rays. Because the ceramic itself is a poor conductor, little heat is lost to the back of the burner.

The large air-hole area has an extra use, too: So little back pressure is built up that the burner can use air at ordinary atmospheric pressure. No compression (as in the Pyrocore) is necessary. But—efficiency is not as high.

The gas people have also been working to improve conventional heaters. So many new dodges have been tried in the past few years—and are panning out—that experts advise looking for equipment that now has (or soon will have) such features as these:

1) Sealed combustion. Many of the conventional wall heaters offer burners and combustion chambers that are shut off from the room itself. The burners feed on outside air only, are cleaner, odorless, lint-free. The sealed combustion chambers allow long fingers of flame to travel safely, deliver more heat.

2) Direct vent. Many companies make wall heaters with intake and exhaust pipes built into the outside wall. With no need for chimneys, the units are easier to install, cheaper, more efficient. (No



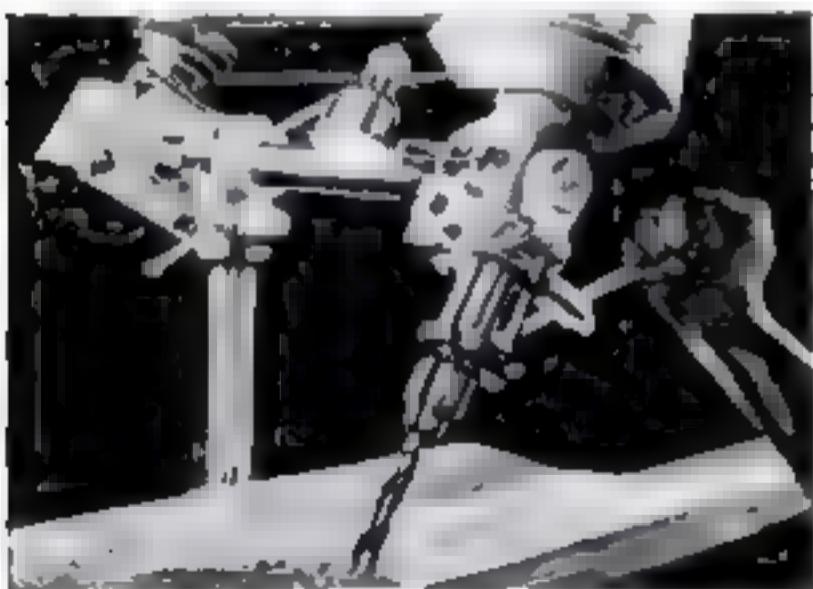
SHOP FULL OR SINGLE TOOL you can do more with DELTA

Every tool you choose for your workshop should deliver more than just extra capacity to handle your latest project idea.

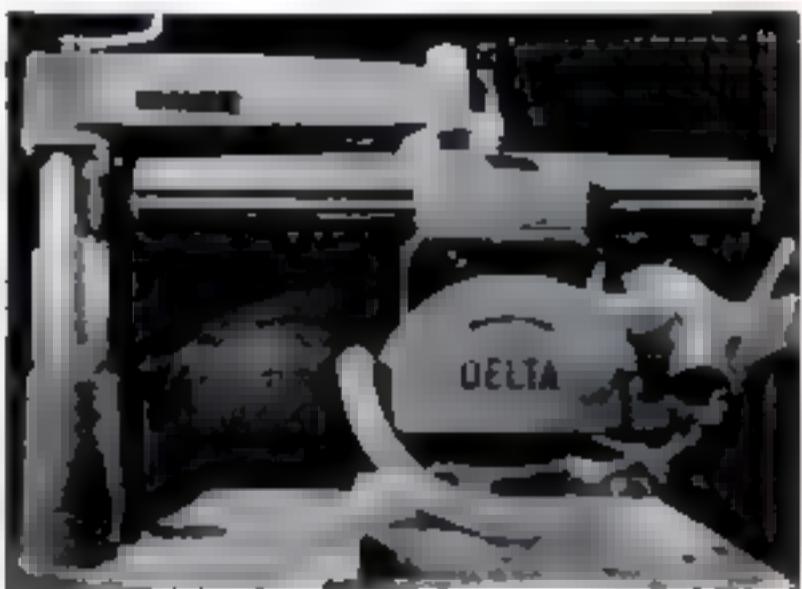
You'll want built-in precision you can rely on for years to come—versatility that extends the range of useful jobs you can do—advance engineering features to give you convenience and safety that can double your shop fun and

relaxation. Delta Power Tools give you these important advantages.

So whether your "dream shop" plans include a tool for every operation, or simply several basic tools equipped with low cost accessories to handle a wide variety of applications, plan now to see Delta tools. No other power tool line is more complete—or can help you do more.



New 32" Radial Drill Press makes "impossible" drilling easy. Does dozens of additional jobs—routing, mortising, shaping and plug cutting. Truly flexible for "big job" capacity!



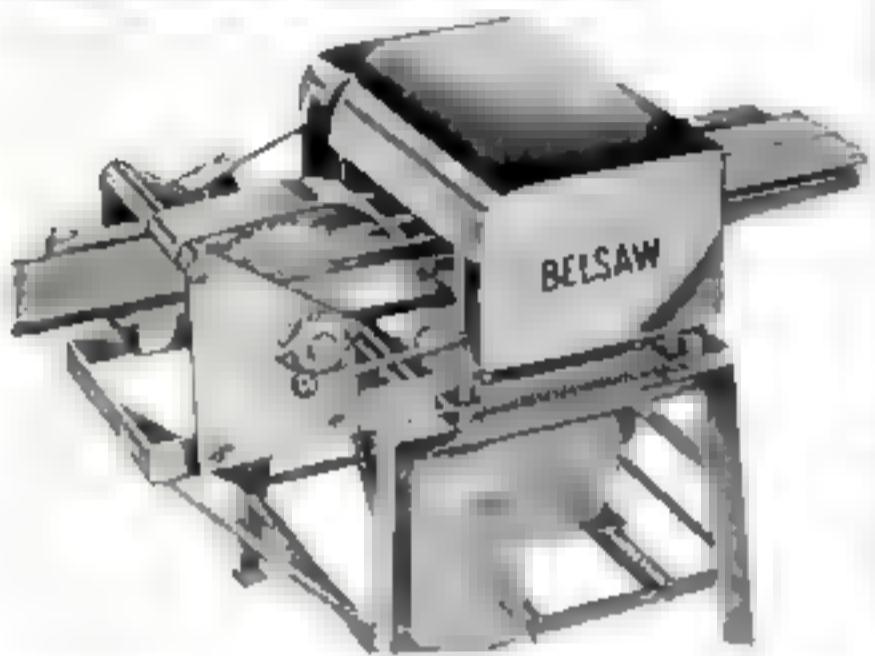
9" Radial Saw tackles everything from plain and fancy ripping, mitering and dadoing to moulding, grinding and finish sanding. It's a one tool workshop in 5 sq. ft. of floor space!

FREE Deltacraft Library Catalog—Pick the type of home workshop publication that would be the biggest asset to your shop. Write: Rockwell Manufacturing Co., Delta Power Tool Division, 504B N. Lexington Ave., Pittsburgh 8, Pa.

DELTA POWER TOOLS
another fine product by
ROCKWELL



MULTI-DUTY POWER TOOL



Now you can use this ONE power feed shop to turn rough lumber into high-value moldings, trim, flooring, furniture... ALL popular patterns.

RIP... PLANE... MOLD... separately or all at once by power feed... with a one horse-power motor. Use 3 to 5 HP for high speed commercial output.

LOW COST... You can own this MONEY MAKING POWER TOOL for only...

\$30⁰⁰
down payment

Send coupon today

BELSAW POWER TOOLS

921 Field Bldg., Kansas City 11, Missouri

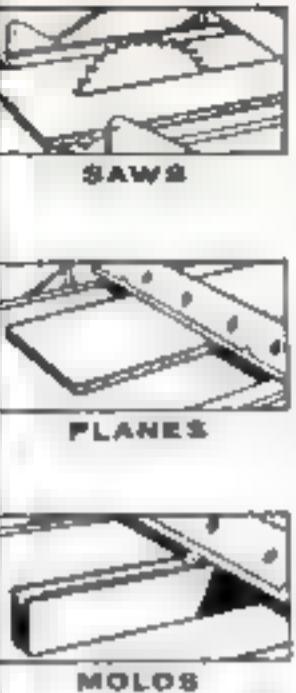
Send me complete facts on the MULTI-DUTY Power Tool. No obligation.

Name _____

Address _____

City _____

State _____



New Gas Furnaces

cold flue drafts, for one thing.) As progress in forced-draft burning continues, the newer units will be able to operate with almost miniaturized vents instead of the six- or eight-inch widths that are standard today.

3) Counterflow. Wall heaters made by Empire Stove Co., Belleville, Ill., draw return air in near the ceiling and deliver heated air near the floor. This is a reversal of the usual method of sucking in cold air at the floor. Not only does counterflow permit the warmed air to rise naturally, but it's also cheaper to heat the already warmed air fed in at the ceiling.

What lies ahead. Manufacturers and gas-utility researchers in the lab are studying the new combustion methods in earnest, testing the new ceramics or other radiant materials. They're also making tricky spark igniters using transistors and batteries that are recharged when the heater is operating. That work is part of the general plan to make gas appliances completely automatic, and independent of electrical wiring.

The American Gas Association has even come up with the industry's rival to electric baseboard heating: A gas-fired heater which, in its aluminum liner, could fit in the standard stud space of an outside wall. The heater's sealed burner feeds a continuous eight-foot flame through a $\frac{1}{8}$ -inch stainless-steel tube. Intake and exhaust pipes are both outside. The lab model is 80-percent efficient.

Prompted by military needs as well as consumer possibilities, the industry is also pressing research in thermoconversion—ways of turning heat directly into electricity.

One way to do it of course is with thermocouples. Another is with a thermionic generator, a device that boils electrons off a metal surface, and bonds them to a nearby (.001 inch) acceptor plate. Space scientists hope to use sun heat for such converters.

The researchers also hope to produce a cheap, reliable, reasonably efficient fuel cell—a gas-fueled battery that would work much like an ordinary wet cell, converting chemical energy to electrical energy permanently, or at least as long as it was fed the industry's choice commodity—gas.

The 30 hp. Bundy 500 is a new outboard motor that achieves a new standard of compact simplicity, economy and performance. It was designed for you, the boating enthusiast with an above average sense of value. In one package the Bundy 500, the perfect family motor, gives you power to do any of the things you enjoy in boating.

DID YOU SAY POWER? Compares to 35 hp. . . . plenty for waterskiing and sight-seeing cruises. And with twin Bundy motors, you have 60 hp. and double dependability.

DID YOU SAY SLOW TROLL? No need for that special trolling motor. The Bundy 500 will troll down with the smallest, just as steadily and economically. Unique oil-scavenging system prevents "loading-up" and "plug-fouling".

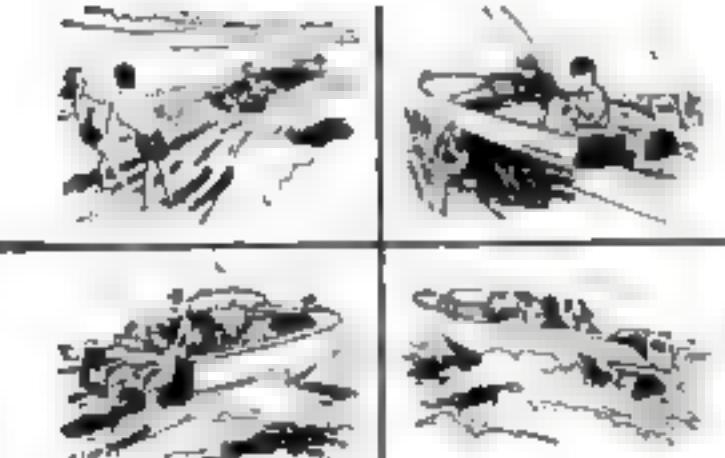
DID YOU SAY ECONOMY? The Bundy 500 costs less initially and runs with the economy of a 25 hp. Others use up to 66% more fuel! You use regular gas and outboard oil for additional savings.

DID YOU SAY QUIET? The Bundy 500 is naturally quiet. Perfect balance and fit of parts give the Bundy the quiet hum of precision machinery.

DID YOU SAY VALUE? Styled by Ghia of Torino. Engineered by Innocenti. Manufactured by Italian craftsmen for American boatmen. Weighs approximately 1/3 less than others in its power range. Includes electric and manual starting. Magnetic Alternator recharges battery. Ingeniously simple for quick, low-cost service. The finest quality outboard engine available anywhere today. Fully warranted. Available in limited quantities through select marine dealers.

did you say Versatility?

SKIING
TROLLING
CRUISING
FAST SPINS



BUNDY

500  *by Ghia*

Write for free literature.

BUNDY MARINE
D-1 F-2 S-15
Model 500 - 30hp 60hp

The Miracle of Transistors Brings You



110 AC FROM BATTERIES

©1960

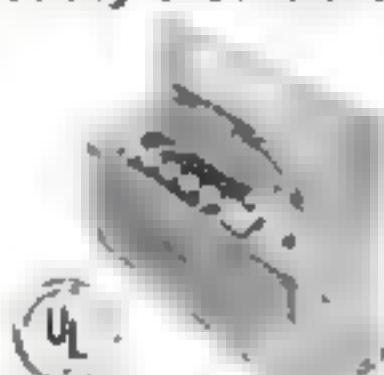
Dependable Power for Hundreds of Uses

Now—using a totally new concept in electronic design—the ESB engineers have developed a revolutionary, fully transistorized inverter-charger, the ESB ACTIVERTER. This major breakthrough in "packaged power" means that you can now have the convenience and the utility that 110 Volt AC current can bring, and you can have it wherever you can take a 12 Volt storage battery!

Just connect the ESB ACTIVERTER to a battery and you can have 110 AC instantly anywhere for many hours. You can plug in portable electric power tools, an electric blanket, electric lights, even a television set! A flick of a switch and the ESB ACTIVERTER fast or slow charges 6 or 12 Volt batteries.

Compact, Rugged, Truly Portable

The compactness of the ESB ACTIVERTER design makes it possible to have a 12 Volt storage battery, an inverter, and a battery charger all in one self-contained and portable package. The PAK-O-POWER ACTIVERTER model provides a source of 110 Volt AC, with an output rating of 500 Watts. In a package the size of a portable picnic cooler! Because solid-state electronic components are used throughout, ACTIVERTERS are both rugged and lightweight. There are no moving parts, no vibrators.



4 Sizes — from 150 to 500 Watts

MODEL I-152 INVERTER — Inverter only, operates from direct connection to 12 Volt battery or through cigarette lighter socket of car with 12 Volt system. Output ratings: Intermittent Use — 150 Watts, 1.5 Amps, AC; Continuous Use — 125 Watts, 1.2 Amps, AC. Shipping Weight: 8 lbs.

MODEL IC-252 ACTIVERTER — Inverter-Charger operates from direct connection to 12 Volt battery. Output ratings: Intermittent Use — 250 Watts, 2.3 Amps, AC; Continuous Use — 200 Watts, 1.8 Amps, AC. Shipping Weight: 15 lbs.

MODEL IC-200P PAK-O-POWER — Inverter-Charger with compartment for 12 Volt battery. Completely self-contained unit. Output ratings: Intermittent Use — 200 Watts, 2.3 Amps, AC; Continuous Use — 200 Watts, 1.8 Amps, AC. Shipping Weight: less battery 22 lbs.

MODEL IC-500P PAK-O-POWER — The Multi-Service Inverter-Charger-Car Start unit with large 12 Volt battery compartment and Car Start leads. Completely self-contained with built-in fast and slow charger — Charging rate: 10 Amps for 6 Volt, and 40 Amps for 12 Volt batteries. Output ratings: Intermittent Use — 500 Watts, 10 Amps, AC; Continuous Use — 300 Watts, 2.6 Amps, AC. Shipping Weight less battery: 55 lbs.



THE ELECTRIC STORAGE BATTERY CO.
Makers of

Packaged Power

Willard Exide - Gray - Swiss - Durite

The Electric Storage Battery Co.
Automotive Division Dept. PS-2
P.O. Box 6266 - Cleveland 1, Ohio
I want to use 110 Volt 60 Cycle AC for _____

Please send me ESB ACTIVERTER information without obligation

Name _____

Street _____

City _____ Zone _____

State _____

10,000 Miles in a Tempest

[Continued from page 91]

fuel tank—the Tempest holds 15½ gallons. But careless gauge calibration—it showed zero with almost five gallons aboard—enhanced the illusion of a small tank.

Fermoyle complained about rain leaks, Allaway about the trigger-release parking brake, and the one-piece tailgate that forbids handling long loads.

After these bleats, as the staff termed its criticism of design and construction, the critics went on to praise.

For Fermoyle, "The engine ran like a clock." Markovich liked the layout of the engine compartment, "Except," he said, "for the voltage regulator, mounted on the firewall where it could short out in heavy rain." He found entrance and exit easy.

For Mann, the Tempest was tight, quiet, and comfortable. Rowsome noted the car was not wind-sensitive. The tidiness of the rear-seat fold-down rig, and the extra underfloor luggage space, pleased him.

Safety and Comfort Features

Markovich had some second thoughts: "The dull-finished dash eliminates sun reflections. The heater is excellent. So is the all-around visibility. Hurrah for the manual choke!"

Fermoyle: "The big wheels help smooth out deep holes."

A plus for that gearshift that roused Mann's ire: "It's crisp and sure."

Allaway put it straight for the staff: "Handsomest of all the compacts."

Summing Up

Rowsome: "Despite all demurrs, you have to look at this car in its context—a four-cylinder engine, lots of room, and at a price hundreds of dollars below that of the 'big' station wagons."

"Our beefs might well be washed out in Tempests in other configurations—a sedan body, an automatic transmission, the optional hop-ups of the four, or, indeed, the optional V-8."

Next Month:

10,000 Miles in a Dodge Lancer

Sands **FAST** with big
25 sq. in. sanding
surface and 14,400
strokes a minute!

Weller® POWER SANDER

A fine quality, power-packed tool that's unmatched in value and performance at its price. Puts a satin-smooth finish on new wood. Removes old paint in a jiffy. Low, compact design fits snugly in palm of hand. Easy to guide. Light in weight, too. Use it overhead without tiring. Plus these other Weller features:

- Positive straight line action sands with grain—never bucks, twists or scars wood
- Sandpaper locks simply and securely—no special tools needed for replacement.
- Fingertip "on-off" control.
- 8 ft. cord.
- Guaranteed for 1 year.
- UL approved.

\$13⁴⁸

MODEL 700



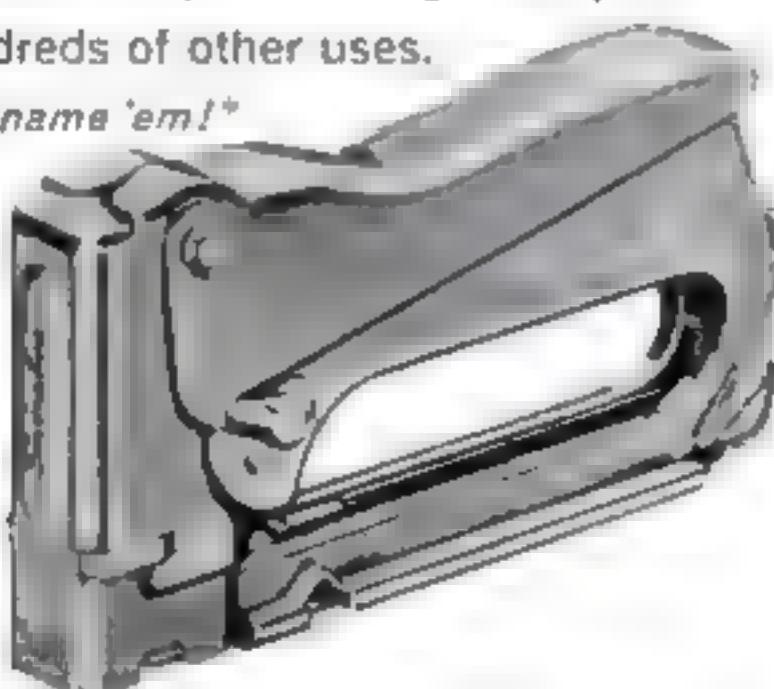
AT YOUR HARDWARE OR HOBBY DEALER

WELLER ELECTRIC CORPORATION • EASTON, PA.

screens, upholstery, carpets...

hundreds of other uses.

You name 'em!*



Swingline 101 Staple Gun

Staples practically anything. Exclusive push-button loading and built-in staple extractor. At your stationery, department or hardware store.

only **4⁹⁵**

*Win \$5 per idea!

Swingline pays \$5 for each practical new idea on how to use the SWINGLINE STAPLE GUN...to be published in "Tips for Tacking." Send your ideas today!

Send for FREE
12-page booklet
"Tips for Tacking."



Swingline INC.

138-00 Skillman Ave., Long Island City 1, New York

THE SIGN OF QUALITY IN PACKAGED FASTENERS



Wood Screws • Stove Bolts • Machine Screws
Machine Screw Nuts • Tapping Screws • Carriage Bolts
Drive Screws

**SOLD THROUGH LEADING HARDWARE AND
BUILDING SUPPLY DEALERS EVERYWHERE**



mustang magic in your garden

Bolens Mustangs take the toil out of tilling, make gardening magic from start to finish. Prepare seedbeds by gently blending compost or cover crops into topsoil. Weed, mulch, cultivate and aerate through the growing season to keep flowers and vegetables thriving. Does your garden work like a professional . . . even if you aren't one? Three models. Super for all-around tilling versatility. Heavy-Duty for larger acreages and Professional for extra rugged service. Let your Bolens dealer show you Mustang "magic" in your own garden. Send a postcard for his name and a free "Home Gardening Handbook."

EXCELSIOR

Feed Machinery & Chemical Corporation
Pert Washington, Wisconsin

America's Finest Outdoor Power Equipment

AUTOMATIC

MAKES NEW
PROFITS

RETOOTHING

HAND SAWS

Cuts new teeth in 30 seconds—any size 4 to 16 points. Old teeth fall off as chips. Easy to operate. A perfect job.

BURR MFG. CO.

8943-P VENICE BLVD.

LOS ANGELES 24, CALIFORNIA

Free literature

E TOOLS WHOLESALE

Start your own business, sell tools to your friends and neighbors, or buy tools for your own use and **SAVE MONEY \$55**

A MILLION DOLLAR INVENTORY AT YOUR FINGERTIPS. NO STOCK TO CARRY OLDER AS YOU NEED IT.

BUY AT WHOLESALE PRICES. Enter \$2.00 profit on every item you purchase. \$1.00 refund on first purchase or refunded if you are not 100% satisfied.

SILVO HARDWARE CO. Dept. P-2 107 Walnut St., Phila. 6, Pa.

*1.00
PUTS YOU IN BUSINESS

What Steel Is That? *[Continued from page 180]*

"Back there at the blast furnace," Dutch went on, "your hot iron picked up carbon from the coke and dissolved it, as water dissolves sugar. There's about four percent carbon in cast iron, making it crystalline and brittle."

"What about steel?"

"I'm coming to that. Suppose you put your cast iron in another furnace and burn out the carbon. Throwing in some iron oxide does it, or you can speed the process by bubbling compressed oxygen up through the metal. The impurities in the iron combine chemically with the slag, and when you run out the batch it's relatively carbon-free iron. Just a trace left in it—about one-tenth of one percent. That's mild steel."

"How about tool steel?" I asked.

"Simply add some carbon to your mild steel. Melt it up again and toss in a little ground anthracite, maybe, or a small piece of cast iron. Say you want some steel for cold chisels; then you increase the carbon content to eight-tenths of one percent—80-point steel, that is. Up the steel to 130 points and you can make razor blades of it. But you don't want to go much higher than that. If you do, your steel will be almost as brittle as cast iron again."

Alloy steels. "While I'm at it," I asked, "why don't I stir in something to alloy it?"

"Alloy steels are a little tougher than plain carbon steels, and they're easier to harden."

"How come?"

"Because you can give them a slower quench. Plain carbon steels have to be quenched in water or brine in a hurry, to cool them fast enough to form hard carbides. Drastic quenching sets up strains in the metal that can warp or crack it. But if you use a steel with a little chrome or nickel in it, you can harden the tool in warm oil."

"I've read about 'oil-hardening steel' somewhere," I said.

Dutch nodded. "That's a definition for low-alloy steels, just as plain carbon steel is sometimes called water-hardening steel. Then there's another group of steels containing about four percent chrome called air-hardening steel. Just cooling in air hardens them."

What Steel Is That?

"Stainless steel is a chrome alloy, too, isn't it?"

"It's a high-alloy steel," Dutch said, "with anywhere from 11 to 27 percent chrome. Good enough for kitchen knives."

"Getting back to knives," I said, "you told me this ground stock of mine is low-alloy tool steel. Then I quench it in oil?"

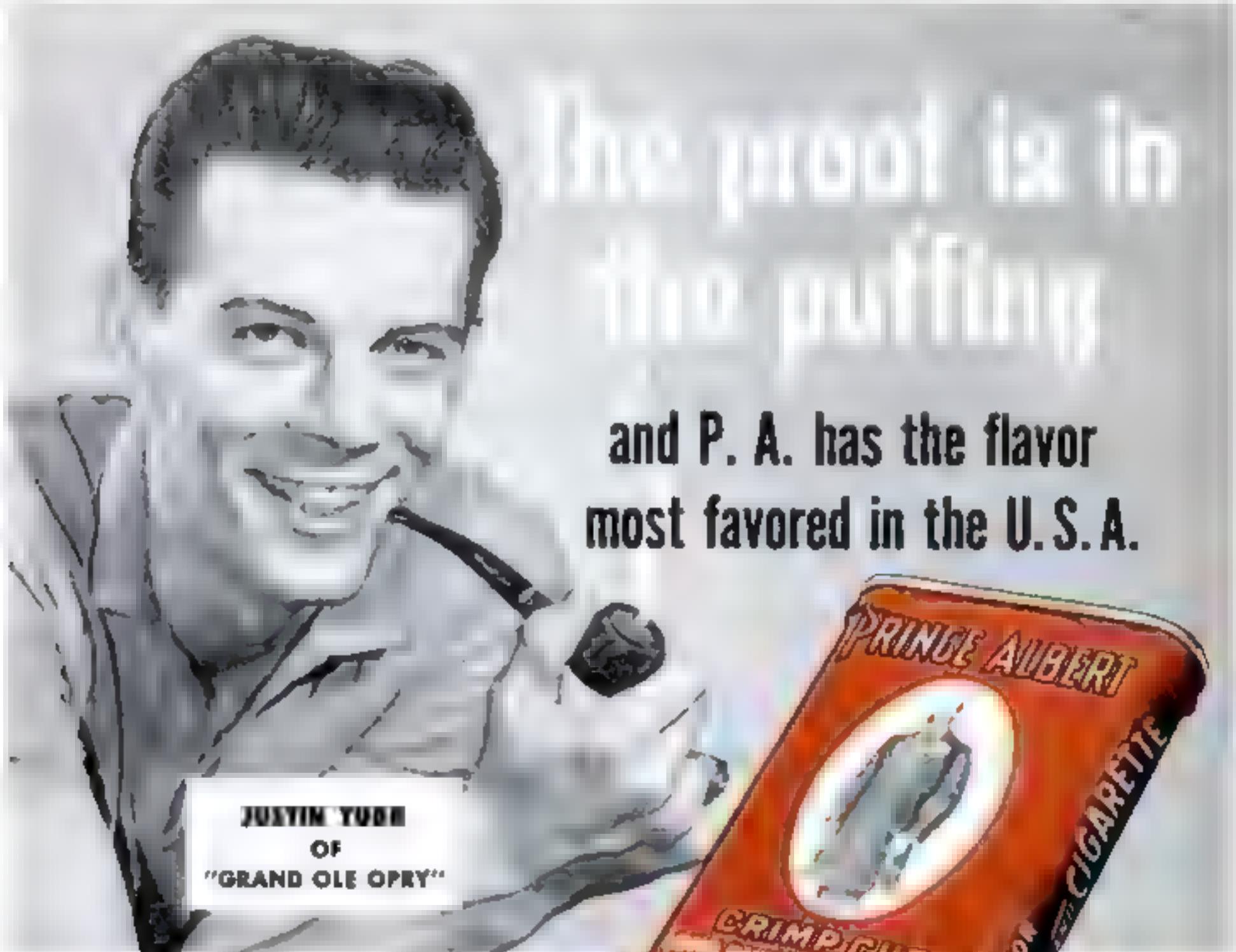
Oven-tempering. "You're learning fast," Dutch grinned. "It'll probably quench out file-hard. Then temper it at about 400 degrees to relieve strains in

the metal. Safest way is to put it in your kitchen oven for a couple of hours. If you use a torch it may get too hot."

While we'd been talking, Dutch had finished shaping the spring for his cookie cutter. Setting it on the backing plate, he flowed solder around the joint with his torch and trued the cutting edge on his sanding disk. We went upstairs and his wife looked it over approvingly.

"Thanks, dear," she said, "but what took you so long?"

My sheath knife turned out fine.



and P. A. has the flavor
most favored in the U.S.A.

PRINCE ALBERT
CRIMP CUT CIGARETTES
FOR THE CIGARETTE

R. J. REYNOLDS
TOBACCO CO.
Winston-Salem,
N. C.

- always tastes fresh
- mild, mellow flavor
- cool 'n' steady burning

PRINCE ALBERT

America's Largest-Selling Smoking Tobacco!

O'Sullivan's Wonderful Lead Balloon
[Continued from page 77]

for the
man
who has
everything
but...



**THE
HANDIEST
PLIER OF THEM ALL!**

CHANNELLOCK®

Your tool kit isn't complete until you own a CHANNELLOCK. Why? No other gripping tool does so many jobs so well . . . the reason why thousands of skilled mechanics—year in, year out—buy CHANNELLOCK in preference to any other plier. Available in three jaw capacities: $\frac{1}{4}$ ", $1\frac{1}{2}$ " and 2". Ask your tool supplier for a genuine CHANNELLOCK Plier. If he's out of them, ask him to order one for you.

Write for Catalog of Complete Line of Pliers

CAMPION DEARMONT TOOL COMPANY

MEADVILLE 2, PENNSYLVANIA

them on Mylar in layers far thinner than air-mail onion-skin paper. Then O'Sullivan heard a rumor that Reynolds Metals Co. had experimented with placing vaporized aluminum on plastic. That process did the trick.

One hour O'Sullivan was in his office at Langley Field, the next he was pacing through the laboratory or the shop; a few hours later he flew to Washington. He worked nights, weekends; he pushed his men; he prodded them with buckshot rounds of ideas; he kept government support alive; he demanded that industry provide solutions to problems it thought unsolvable.

How can you find a way to fold a perfect sphere so it can be expanded in a hurry without the single locking fold that would cause it to tear? Harassed by O'Sullivan, men who couldn't fold a road map properly found a way to fold his aluminum balloon.

How do you inflate the balloon? A jigger of air would expand so fast at the edge of space it would blow the satellite apart. When the satellite was shot out of the container, just enough gas had to form inside to inflate it—not too fast and not too slowly. They tried water, beer, dozens of strange chemicals before they discovered the right combination of sublimating powders that would turn to gas under the temperatures hundreds of miles up.

Building a satellite, however, was only part of the job. It had to be tested. Vacuum tanks were designed for the job. When O'Sullivan couldn't see what happened inside, he had a pressureproof porthole built in the side. The eye couldn't follow the sudden explosion of the balloon, so he ordered high-speed strobe-light pictures taken. Normal floodlights burst in the vacuum, so then a new lighting rig had to be created.

At last O'Sullivan thought his work was finished. He had built a 30-inch satellite that could be squeezed into the cranny he was assigned on a Vanguard. But the rocket wasn't ready to be fired. Months passed while the Vanguard project languished.

Instead of quitting, O'Sullivan impatiently started campaigning for a 12-foot inflatable satellite—something the whole

SURPLUS SALE

POWER PLANTS—GENERATORS

- Deluxe Govt. units 115-v. 50-c. large tele. 1000-watt, 115-v. 50-c. plant \$159.95
- 1500-watt, 115-v. 50-c. plant 279.95
- 2500-watt, 115-v. 50-c. plant 259.95
- 3500-watt, 115-v. 50-c. plant 249.95
- 7500-watt, 115-v. 50-c. plant 399.00
- 7500-watt, 115-v. 50-c. plant 399.00
- 2500-watt, AC generator only 209.25
- 5000-watt, AC generator only 209.25
- 12,000-watt, AC generator only 329.95

POWER TRANSFORMER

110-220-440 volts

- Item #1519 Brand new was surplus step down step up transformer Change 440 of 220 to 110 Volts or vice versa Use in car for ex. Turned old to get higher voltage 1000-watt capacity Size 8" x 8" x 2" Wt 26 lbs Gov cost 139.95 \$15.61 FOB

GOVT. GEARED BATTERY MOTOR

- Item #273, Powerful geared down motor Runs on 6 or 12-v. 1 hp for golf cart, boat, etc. Reversible speed 25-50 rpm. Wt 35 lbs. Gov cost 12.95 \$18.95 FOR



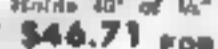
HEALTH CHAIR MASSAGE MOTOR

- Item #2019 Brand new Govt. Manufacturer off ex. same Govt. on surplus cabinet health chair. Make your own reclining chair. Large for in. minutes, relax, pain, sore muscles, etc.
- Capacity of 115-v. AC motor w. in dash & eccentric weight ventillation cooling fans, etc. Has mounting holes for easy attachment to chair. Sponge rubber pad furnished for direct use on vinyl. Wt 8 lbs. Size 7" x 8" x 4" List \$18.95 \$8.69 FOB



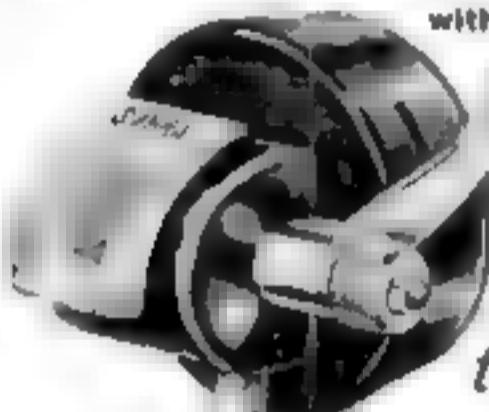
6 or 12-V STORAGE BATTERY WINCH

- Item #311 Powerful fully reversible ball bearing gear mechanism w. both 1000-watt dc. per. 1 hp on 6 or 12-v. battery. Wt 40-lbs. Gov cost 229.95 \$46.71 FOB



Own the new closed-face casting reel—

with NEW power-shift handle



Built

to Land

the LUNKERS

SABRA

by Johnson REEL

See the fishing reel you actually shift from direct-power retrieve to fish-beating drag in 1/10 second without ever taking your hand off the handle. Control the running fish, the deep-down lunkers with all the power you'll ever need. Casts like a dream. No backlashes, ever. Packed with two spools of line, one 15-lb. test monofilament, the other 15-lb. test casting line. Easiest reel on the market to lubricate and clean. Own bait-casting power with full drag control. Own the Johnson SABRA. Ask your dealer today or write for free literature.

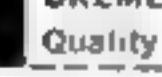
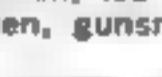
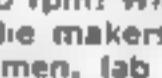
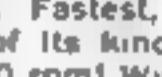
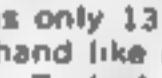
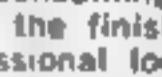
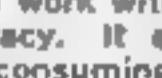
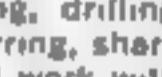
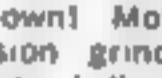
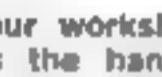
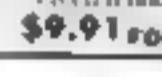
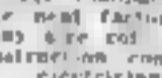
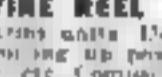
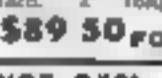
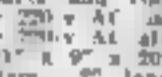
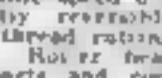
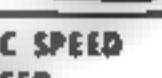
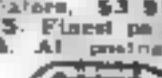
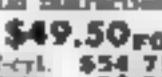
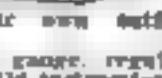
JOHNSON REELS, INC.
6261 Johnson Park, Mankato 33-C, Minn.



GOVT SURPLUS EXCESS INVENTORY BANKRUPT STOCK

AIR COMPRESSOR BARGAINS

- For portable cleaning, tire, central heating, Assemble your own outfit. Central power w. C. S.
- Deluxe Air Compressor, tank, gauge, regulator, silent gear, fittings. How to build instructions. List \$25.00
- Air Compressor 2-cyl. \$21.50. 2-cyl. \$54.75. Gov. Air Tank, \$10.95. Regulators, \$3.95. Pump OR \$1.75. Pres. Gauge \$1.75. Fixed price \$11.50. Auto switch \$4.75. All pre-owned



only PROTO makes screwdrivers like this

Plastic molded around flattened tang...locked for life.
Listed. Wide flutes.
Bigger handle for more power. Smooth end prevents sore palm.

Round or square. Forged from Protoloy® alloy steel. Resists distortion. Heat-treated full length. Polished, plated.

Gradual taper, squared tip for snug fit.

Proto Screwdrivers are available in a complete range of sizes and types, including plastic and wood handles, keystone, cabinet, Phillips, and clutch-head tips; round and square shanks; lengths up to 2½ feet; offset type; screwholding drivers; and screwdriver sockets.

See your Proto Auto Jobber; Builders Supply, Hardware Dealers, and Industrial Distributors for professional quality tools, parts, and equipment.



2203 Santa Fe Ave., Los Angeles 54, Calif.
503 Main St., Indianapolis, Ind.
1703 Robert East, Guelph, Ontario, Can.

Send 25¢ with your name and address for fully illustrated Catalog of over 2300 Proto Tools.

NEW CATALOG!

FINE DOMESTIC & IMPORTED

WOOD

and over 1500 items for the
HOME WORKSHOP

DIG DISCOUNTS on Latest Models

STANLEY POWER TOOLS

Upholstery Materials
Lamp Parts
Mosaic Tile Supplies
Modern and Traditional Turned Legs
Metal Legs—
All Finishes
Craftsman Hardware
Music Box Movements
Hand and Power Tools

Hardwoods, Veneers, Plywoods,
Mouldings, Mosaic Tile, Ornaments,
Tools, Archery and Skating Woods

AT LOWEST MONEY-SAVING PRICES!

Your complete wood and workshop buying guide—new 182-page edition now ready! Startling savings on everything you need! Your complete wood buying guide and project book. Craftsman is your best, most complete source of finest kiln dried domestic and imported woods. Beautiful wood inlays, colorful bandings, matched plywoods, embossed moldings, carved ornaments, newest wood-working tools, "hard-to-find" cabinet hardware; more than 1,600 items! Packed with newest patterns, project ideas and money-making plans. Enclose 25¢ (refunded with first order) to help pay mailing and handling cost. Write NOW!

CRAFTSMAN WOOD SERVICE CO.
Dept. B-2, 2729 S. Mary St., Chicago 15

Craftsman Wood Service Co., Dept. B-2
2729 S. Mary St., Chicago 15, Ill.
Enclosed find 25¢. Rush new CRAFTSMAN WOOD
CATALOG.

NAME _____

ADDRESS _____

CITY _____

STATE _____

RUSH
COUPON
NOW

O'Sullivan's Wonderful Lead Balloon

world could see traveling in space.

O'Sullivan armed himself with three major weapons of persuasion: facts, working models, and conviction. "You don't just tell people what ought to be done," he explains. "You show them how you can do it."

Chances and failures. He fought his case right up to the White House, and with President Eisenhower's initials on his proposal, the 12-foot inflatable satellite was loaded into a Jupiter C nose cone on Oct. 22, 1958. The rocket failed to put the satellite into orbit. Now O'Sullivan's 30-inch inflatable sphere was fitted into the nose cone of a Vanguard at Cape Canaveral, the launch button was pushed, and the rocket dribbled into the Atlantic. His satellite never had a chance.

O'Sullivan was well on the way to what one scientist called "suffering the highest failure rate of any scientist in the satellite field." The failures were not his fault, but each missed chance to put the satellite into orbit might be O'Sullivan's last opportunity. White House approval was necessary to get space on a Juno shot. O'Sullivan got it. Juno II carried another 12-foot inflatable satellite, and once more the rocket failed.

With each rocket failure O'Sullivan seemed to become more stubborn, more obsessed with his idea. He suffered smiles of amused sympathy and some open scorn in the scientific community. One day a colleague kidded him, "Now that you've failed with a 30-inch satellite and a 12-footer, what are you going to do—build a 100-foot one?"

"Yes," he answered seriously. "I am going to do just that."

In fact, work had already begun on a huge satellite, 100 feet in diameter. It would be used to test the theory of Dr. J. R. Pierce of Bell Laboratories, Inc., that signals bounced off passive reflectors in space could provide global telephone and television communications.

Testing a 10-story satellite. O'Sullivan was faced with a new problem—a 10-story-high satellite would have to be tested at the edge of space, for no vacuum tank big enough could be built. A rocket called Shot-Put was designed to do the job.

The first time the hundred-footer was fitted into Shot-Put and launched from

WAR SURPLUS AND OTHER EXCESS STOCK SAVE UP TO 90%



SOUTH WIND HEATER & ACCESSORIES

Manufactured for overland antarctic expeditions for jeeps and half-tracks. Heating unit puts out over 20,000 BTU's. Extra regulating type. Burns any type fuel. 6 volt system. Fuel consumption extremely low, 1 gal per 8 hrs. Terrain for trucks, etc. Wt. 50 lbs. Dimensions 36" x 18" x 12". Approx. GOVT COST \$350. Ship wt. 50 lbs. gross. NEW \$38.00. Limited quantity. Also available in 24 volts \$38.00.

CHRONOMETRIC TACHOMETER

Built to U.S. Navy & A.P. Force specs. Does not count revolutions per min. of any rotation. Can be used on speeds up to 1000 RPM. Accuracy ± 1% of 1% of scale. Scale from 0 to 1000 RPM. Weight 1 lb. Case made of aluminum & formed glass & rubber. Hand case. GOVT COST \$27.50. NEW \$12.95 ppd.

ELECTRIC STORAGE BATTERY WINCH

Electrically driven heavy duty. Winch drum with 1/2 hp. DC motor. 10 ft. of 1/4" cable can be operated manually by hand crank. Use on 12-24-32 V battery. Lift cap. 400 lbs. 10' plus. Complete with mounting flange, safety locking brake and rods. Ready to use. Approx. Wt. 17 lbs. Length 17" wide 6" high. For Jeeps, trailers, boats, trucks, etc. Approx. GOVT COST \$400. NEW \$46.50.

COMPLETE 2-WAY TELEPHONE SYSTEM

For use on the phone in the home shop, farm, school, etc. Excellent extension with 2 way buzzer system. Model by Western Electric. Can carry clear conversation for miles. Net weight 10 lbs. 11 lbs. Complete with battery & 30' weather-proof wire—ready for use. A 1 line for only \$13.95.

DELCO DC GENERATOR

12 V. 50 AMP. Built in a rugged cast aluminum frame. 1/2" shaft. Key & keyway. Heavy RPM base. Ship wt. 50 lbs. Input for light truck or 12 volt charger. Approx. GOVT COST \$27. NEW \$17.95.

140-1 REDUCTION GEAR

For beaching boats, winches, hoists. Ideal for motor in golf or boy's electric car. DC motor & clutch. Easily reversible. Wiring diagram furnished. HI torque. 1" speed. Runs on 6-12 or 24 V. Wt. 65 lbs. gross. Approx. GOVT. COST \$300. NEW, \$12.00. Matched sprocket gear for above — \$1.00 ea. #223-1 Reduction Gear — \$12.00.

DC JET GENERATOR ARC WELDING KIT Complete with GE Type CX-77 Generator 10 vols DC 400 Amp. 3000 RPM. 1000 amperes rating for continuous duty. Intermittent duty amperage to 10,000 amperes. 1000 ohms, 1 volt meter, 1 electrode holder 2 cu. 25 ft. length No. 3 welding cable, 1 welder's mask, 1 trigger switch, 10 cu. in. vacuum packed Union, welder's tools & welder's gloves & all the equipment. All units guaranteed pre-tested. Wt. 110 lbs. Approx. GOVT COST \$100. A.C. Generators listed above can be purchased separately. Makes for heavy duty welder cost available in the lowest price range. Welders available. Wt. 90 lbs. Approx. GOVT COST \$400. Gen. alone — \$49.50.



"DELUXE 11" ARC WELDING KIT

Costs 1200 AMP. 100 voltage for a welder kit. Adjustable arc box, electrode holder, etc. Wt. 100 lbs. Approx. GOVT. COST \$150. Units guaranteed pre-tested, \$34.95 each item.



HEAVY-DUTY CABLE

Size No. 0. Four layers total. 400 ft. jacketed 3/8 in. dia. 50 and negative electrode cable for use with welder. High temperature for environment use. Approximate GOVERNMENT COST \$40. 500 ft. long — \$14.95.

BENDIX GEROTOR PUMP & MOTOR

NEW! Use whenever fluid pumping is required. Features 1/2" hydraulic inlet/outlet and 1/2" transfer 3/8 in. dia. Has 3/8" pipe connection. Output 100 ft. of cable adjustable up to 12000 ft. 3000 rpm, 6 RPM 115 H.P., 24 V. motor. Use on 14 to 32 V. Approx. GOVT COST \$350. \$12.95.

NEW 1961 CATALOG Tremendous catalog—our biggest ever. Just like 10,000 of bargains in war surplus & other items. Send 25¢ in coin for your copy today & free copy with order. Where paid, indicated applies to the new. Other prices FOB Culver City, Calif. Send cash, check, or order 30 day C.O.D.

AIRBORNE SALES CO., INC. DEPT. P3261
8501 Stellar Drive, Culver City, Calif.

LICKITY LOG SPLITTER

Ends Wood Splitting Drudgery



Inquiries Invited

For Best Gluing Results in Boat Building

STAY-TITE Marine Adhesive

Developed for boat building woods and exterior structural wood applications subject to prolonged weather exposure in a temperature service range of —40°F. to 300°F. Doesn't brittle out or deteriorate with age. No mixing, ready to use. Up to 60 min. open work time. Bonds plywood with adhesive strength of 975 lbs per sq. inch; bonds vinyl fabric to steel; rubber moldings to wood, fiberglass, steel; aluminum to aluminum. Natural wood color, pt. 12.95 ppd. If no dealer nearby, order direct.

STAY-TITE PRODUCTS CO., INC., Dept. P.S., Cleveland 4, Ohio



Works
in
seconds!

Loosens Rusted Bolts
nuts, screws, "frozen" parts!

LIQUID WRENCH. SUPER-PENETRANT

The super-penetrating rust solvent that quickly loosens rust and corrosion

AT ALL HARDWARE
AND AUTO STORES
RADIATOR SPECIALTY COMPANY
CINCINNATI 4, OHIO



Smooth 18 ton hydraulic power split log profits for you from the toughest woods, including American Elm. 7 HP trailer unit splits under own power to receive large logs without "dead" lift. Has 2 speeds, auto-shift and auto-stroke. 26" ram travel splits up to 34" lengths, any diameter—or, with extended frame and adjustable wedge, splits up to 52" lengths, any diameter. Write for details.

THE WACO AIRCRAFT CO., Dept. K, Troy, Ohio

THREE FOOT WOOD LATHE



All cast iron and steel construction. Guarantees solid steel accuracy. Sold direct from factory.

At end-of-model run bargain. You may be delighted with your purchase—or money refunded on C.O.D. Send express collect.

American Machine & Tool Co., Royersford 38, Pa.

Does your project require

Finely Woven

WIRE SCREENING?

Highest quality bronze wire cloth now available at a fraction of its original cost

We can furnish top quality remnant trim of extremely fine bronze wire cloth from 1/2" sq. to any size your projects require. Write, advising size and possible quantity requirements. We will gladly provide free samples.

WISCONSIN WIRE WORKS
APPLETON • WISCONSIN



SAVE UP TO 85% AT PALLEY'S

DBL. ACTION

1500 PSI HYDRAULIC CYLINDER

Ideal for clutch or throttle control cylinder when used on a motor. Has a 5.8 bore, 4-1/8" stroke, 7/16" shaft, closed length is 25.8". Ports are 3/4" tube O.D. 1/2" thread. Catalog No. H-80.

1500 PSI Double Action CYLINDER No. H-81

Has 7" bore, 7/8" shaft, 9" stroke, eye-to-eye length 14-1/2"

NOW 375

595

SAVE 8% HYD. HAND PUMP

Model H-PBUSH
Operates at 1500 PSI.
Displaces .19 GPM at 30 cycles per minute. Has a capacity of 1.5 cubic in. per stroke cycle. Has a built-in check valve, valve

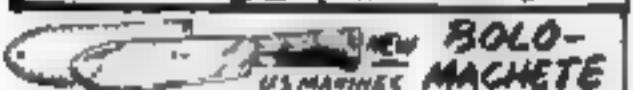
675

HYDRAULIC 4-WAY VALVE

A poppet type spring load valve. Pressure balanced. Off in neutral. Has 1-1/4" tube ports, 7/16-20 threads. Catalog No. H-VTA-1.

Old Gov't Approx. \$10.00

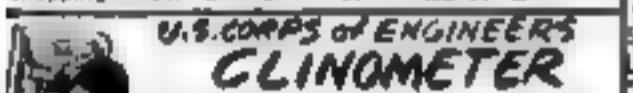
395



NEW BOLO MACHETE

Just released from Gov't surplus. SAVE! Has 11-1/4" tempered steel blade, hardwood handle and genuine leather sheath. Ideal for hunter or camper to clear brush. Use also as meat cleaver or a chopping blade. Cost Gov't approx. \$25.00

249



U.S. CORPS OF ENGINEERS CLINOMETER

Ideal for preliminary survey work. Reads the apparent incline or decline from any point on the horizon in percentages. Has 2-3/4" dia. by 3/8" thick, aluminum scale reads positive and negative level and may be tucked in position for reference. A \$12.95 value.

6.95

TO ORDER Send check w/ M.O. 1/2 deposit. I will C.O.D. Items sh. paid postage or freight collect.

palley's

2263 EAST VERNON AVE. DEPT. PS-71
LOS ANGELES 58, CALIFORNIA

AIR FORCE "COLD WEATHER" FLYING SUIT

298 PR

For winter wear as underwear or as coveralls for outdoor or farm work in cold weather. 100% wool with flannel liner. Sizes 34, 36 and 42. New LOW PRICE

U.S. ARMY COVERALL

388

COST-GOVERNMENT 20%

Mfg. duty here in America. Buttons front. Has 4 large pockets. Cleaned & reconditioned. Sizes small and larger.

SURPLUS SKI PARKA

3.95

Of water-repellent fabric. Size M. Skier-style. Off-white color. Sizes Small, Medium & Large.

AIR FORCE NAVIGATOR'S BRIEF CASE

Of finest cordovan leather. Zipper on 3 sides. Inside has 3 small & 2 large pockets. \$25.00 Value.

NEW 295 USED 199

O'Sullivan's Wonderful Lead Balloon

Wallop Island the firing went well, but far up in the air hundreds of sparkling pieces of aluminized plastic were blown out of the inflated satellite and formed a cloud that glinted in the sunset. Something had gone wrong, and the failure was hardly a private one—the Fourth of July display was seen from Canada to Florida, and the NASA was flooded by thousands of worried phone calls.

Now G. T. Schjeldahl Company of Northfield, Minn., experts in building high-altitude weather balloons, took over construction of the satellite and in six weeks invented a new system of taping the balloon's seams that made them as tough as its 82 panels.

Another test rocket was launched in January, 1960. The second stage didn't fire. A month later the rocket fired properly, but the test satellite tore. Another rocket was only partially successful, for the satellite carried no tracking beacons. Nevertheless, O'Sullivan figured they were over the hump. Now he had a satellite that could be packed in the nose of a Thor-Delta rocket and placed in orbit 1,000 miles above the earth.

The satellite, called Echo, was a miracle of construction. The 31,500-square-foot surface of Mylar was covered smoothly on both sides with only four pounds of aluminum. It was folded into a sphere 26½ inches in diameter. The entire satellite, including the 20 pounds of chemicals to inflate it and two 11-ounce radio-tracking beacons ½ inch thick but packed with 70 solar cells and 5 storage batteries, weighed only 132 pounds. On May 13 it was packed in a Thor-Delta

O'Sullivan drank gallons of coffee, chain-smoked pack after pack of cigarettes, and tried, unsuccessfully, not to worry during the countdown of the Thor-Delta. Finally, the news came like a blow to the stomach: The rocket had failed.

Doggedly, O'Sullivan fought for another try. More memos flew out of Langley. He had strong arguments to answer, and seven failures, even if most of them were not his fault, made him vulnerable. On the last day of May, a fully successful Shot-Put test was completed. But still many authorities were unconvinced.

Could it survive? The nation's best experts on micrometeorites swore, almost to a man, that the satellite would be punc-

\$500 in 4 months spare time

IS WHAT I MADE WITH

the FOLEY LAWN MOWER SHARPENER

"No one can go wrong with the Foley machine—V. J. Patterson wrote us. Get in this CASH business where 99¢ of every dollar is YOUR profit! The Foley Lawn Mower Sharpener handles up to 3 or 4 mowers per hour. Hand mowers run \$2.00 to \$3.00—power mowers \$5.00 to \$8.00.

FREE PLAN shows how to start Foley plan. Send coupon today—no salesman will call.

"In my home town of 3,000 I paid for the Foley 4 or 5 times over the first season. I also put a \$1035 oil furnace in my new home.—B. Mathews

We sharpened nearly 1000 mowers our first season and gained a reputation for the best work.—J. W. Komper

Sharpen Rotary Mower Blades

With the Foley—no more dull, worn, rusty, broken, dull, planer knives or sharp-edged tools.



FOLEY MFG. CO., 206-1 Foley Bldg., Minneapolis 18, Minn.

Send FREE PLAN on lawn mower business and Special Combination Offer

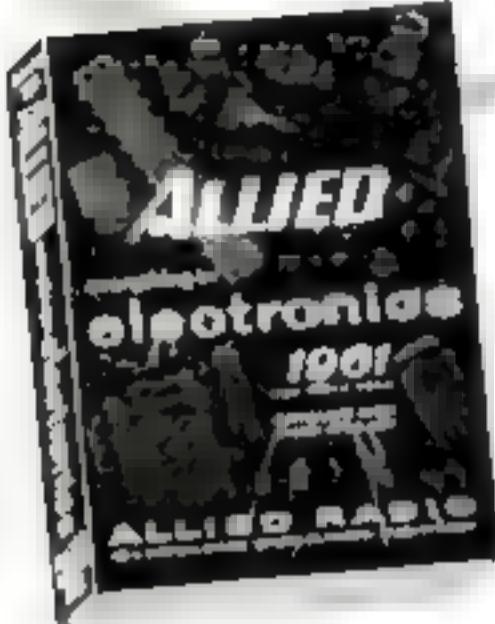
Name _____

Address _____

Simply Great!

ELECTRONIC
knight-kits[®]
A PRODUCT OF ALLIED RADIO

A PLEASURE TO BUILD
 and YOU OWN THE BEST



featured in the
 big 444-page 1961

ALLIED ELECTRONICS CATALOG

free

BIGGEST SAVINGS

Know the thrill of building your own money-saving electronic equipment. Make your selection from the complete KNIGHT-KIT line—available only from ALLIED. Lowest in cost, convenience-engineered for easiest assembly, best for performance; satisfaction guaranteed or your money back. Send today for the 1961 ALLIED Catalog—select exciting KNIGHT-KITS—and...



SAVE ON EVERYTHING IN ELECTRONICS



Get more for your money
 in: Stereo hi-fi systems and components • Recorders and tape • Citizen's 2-way radio • Amateur station equipment • TV tubes, antennas, accessories • Test instruments • Electronic parts, tubes, transistors, tools. Send today for your FREE 444-page Allied Catalog!

only \$2 down
 on orders up to \$50

FREE
 catalog



ALLIED RADIO

ALLIED RADIO, Dept. 27-81
 100 N. Western Ave., Chicago 30, Ill.

Rush FREE 1961 Allied Catalog No. 200

Name _____
PLEASE PRINT

Address _____

City _____ Zone _____ State _____

O'Sullivan's Wonderful Lead Balloon
 tured so many times by cosmic dust hitting the thin plastic at 100,000 miles an hour, that it would be destroyed within hours.

O'Sullivan refused to be talked out of his project. Finally, on Aug. 12, 1960, he had another 100-foot balloon packed into the nose cone of a 92-foot-high Thor-Delta rocket at Cape Canaveral. At 5:39 a.m. it was blasted into the sky. Minutes later Echo I was inflated perfectly, and at 7:41 a recorded message was shot aloft in California and bounced off Echo I to a Bell Laboratory receiver in New Jersey as the satellite passed over the United States.

"This is President Eisenhower speaking," the voice from space said clearly. "This is one more significant step in the United States' program of space research and exploration. The program is being carried forward vigorously by the United States for peaceful purposes. The satellite balloon, which has reflected these words, may be used freely by any nation for similar experiments in its own interest."

Echo I proved the cosmic-dust experts wrong. There just weren't as many micrometeorites up there as they had guessed. The satellite measured the air density and confirmed the scientists' theories that our atmosphere, although thin, still exists 1,000 miles above the earth. O'Sullivan's light, sensitive satellite has further revealed that the pressure of sunlight is strong enough to push Echo I about 60 miles closer to the earth in a month.

For all the world to see. The satellite has also been a significant propaganda weapon for the United States, for people all over the world can look up and see the evidence of our exploration of space with their own eyes.

Today Bill O'Sullivan and his Space Vehicle Group have working models of sausage-shaped space stations, weird space antennas, even monstrous kites and gliders, all inflatable in space. He has chemists trying to find ways of using a plastic spray to stiffen a space vehicle once it is inflated. He has others exploring the possibility of creating plastic materials that might swell into a thick, steel-like girder when affected by solar radiation.

Perhaps O'Sullivan's most astonishing

CONTINUED

**ALL NEW! 1961 Edition of Constantine's
WOODWORKING CATALOG & MANUAL**

Get the biggest Constantine Catalog & Manual—2000 items World's largest source since 1812 for rare imported and domestic woods in veneers, lumber, plywood, bandings, inlays, mouldings, carvings, hard-to-find hardware, new solid brass hardware, wood finishing and upholstery supplies, patterns, tools, woodworking materials, at bargain prices. Also exclusive Inland-Wood Picture Key's Identification Chart of 80 rare woods in color. Inspiring projects, plans, etc. For all-new 1961 Catalog & Manual send 25¢ (refunded on first order). Write today.

FREE — Year's subscription to "Chips & Chata" brings news of exciting woodworking Ideas and latest offerings. Free with \$10.00.

ALBERT CONSTANTINE AND SON INC.
2080 Eastchester Rd., Dept. B-6
New York 41, N. Y.



1000 hr. Apr. 24. Molted. Sustained by fat reserves. No food taken.

MIDGET MOTORS CORPORATION, Athens 2-0.

TRMENDOUS SAVINGS ON

CATALOG

**TREMENDOUS SAVINGS ON
HUNDREDS OF SURPLUS AND
NEWLY MANUFACTURED ITEMS!**

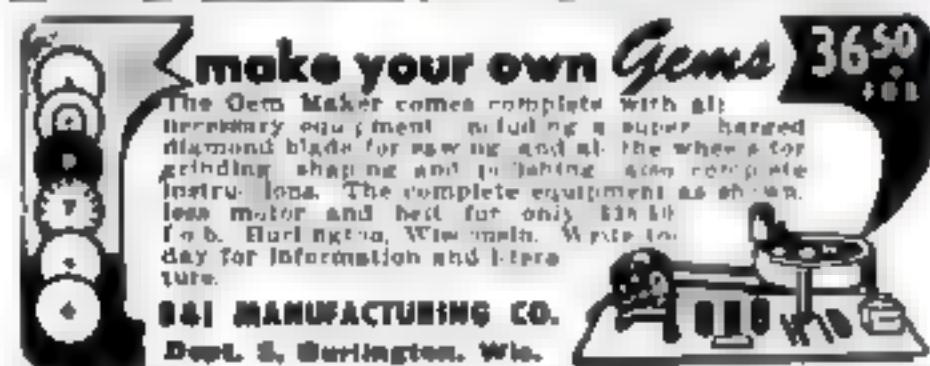
GROBAN SUPPLY COMPANY
1139 South Wabash Ave., Dept. F-2 Chicago 3, ILL., WEBster 9-3793

"MINIATURE MACHINE SHOP"

No Bigger Than A Typewriter, Outperforms Machines Many Times Its Size!

There's a Mechanix Illustrated catalog on ENIMAT in their 3 page feature story in the May issue. If you want a reprint of this story plus complete information about this amazing all-in-1 combination precision tool write to

AMERICAN ERECTOR, INC., UNIMAT DIV., Room 208, 350 Madison Avenue, New York, N.Y. 10017



MAGNETS

PERMANENT ALNICO

FOR HOBBYISTS, INVENTORS, SCHOOLS, FISHERMEN & INDUSTRY	
Govt. Marine Helicopter 130 lbs. Pull	\$8.95
G. V. Sturt's Herkimer 73 lbs. Pull	2.25
Stingeret Reversible Assembly 5-1 lbs. Pull	2.50
Pence I Type II Snap Tools 10 for	2.00
Butt Joint Board Snap sets 10 for \$1.00 30 for	4.00
Post & Wire Magnets 20 for \$1.40 30 for	1.00
Post Magnets 1" 10 at 15 for	2.00
Stingeret Snap Latches 10 for	2.00
F. B. Aeroplane Small Mortise	1.50

10 DAY MONEY BACK GUARANTEE
CHECK OR MONEY ORDER. MONEY NO C.O.D.

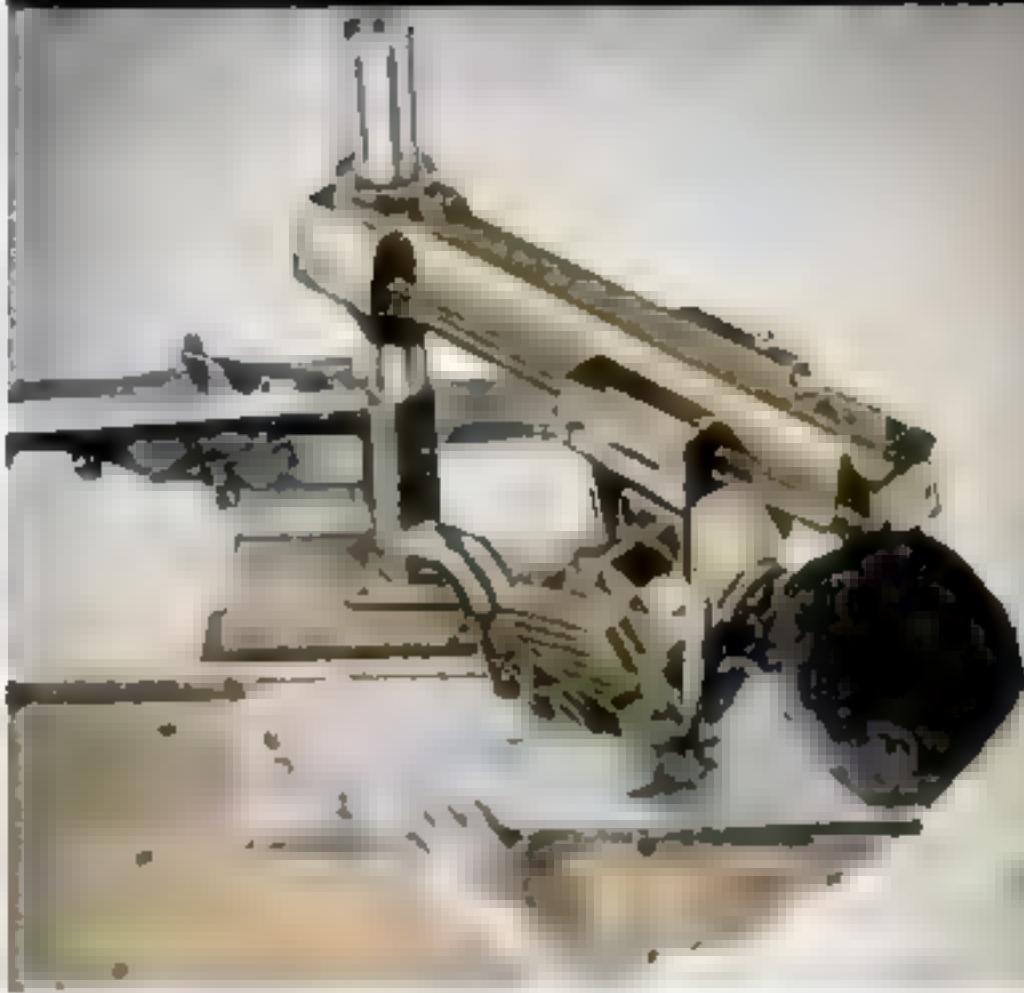
THE MAGNET HOUSE
18023 VENTURA BLVD. ENCINO, CALIF.

TUBA SAWSMITH

*the Complete
Home Work Shop
with exclusive*



**Most versatile of all radial arm saws,
SAWSMITH swivels and tilts for any cut
... flips from one operation to the next
with a twist of the wrist . . . performs
14 basic woodworking operations with
dial-controlled speed. Only \$239.00**



Now with optional ADD-A-TOOLS:
Jointer, Bandsaw, Belt Sander, Paint
Sprayer-Compressor, SAWSMITH per-
forms every conceivable operation . . .
from a single motor, a single stand!



ACCESSORY SALE

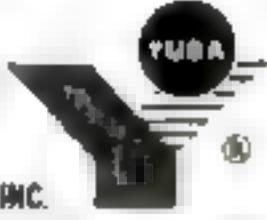
Up to \$45.00 Bonus Value

Choose any 5 Bonus SAWSMITH Accessories for 1 penny each or select a \$39.95 cabinet storage base for only 5 pennies when you buy a SAWSMITH. Limited time offer!

For more details write Post: BPS-261.

TUBA POWER PRODUCTS, INC.

A Subsidiary of YUBA CONSOLIDATED INDUSTRIES, INC.



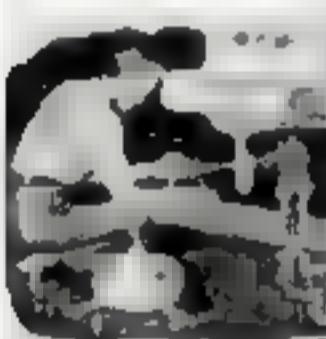
Schupack's Amazing Tool Bargains!		Save up to 100%!
27 Mounted Wheels & Miniature Cutters. Regular \$11.00 value SPECIAL 10 PIECES for ELECTRIC GRINDERS Or Done 100% off CUT OFF WHEELS Sanding Discs Mounting Staves Flat or Spiral Router Bits Bandsaws and other items	\$1.50 P.P.	
10 PC. MOUNTED WHEELS For cutting and grinding on wood, metal or plastic. Includes 20 total wheels and points on 1/2" shanks. 24 in. x 1/2" cutters on 1/2" shanks, 26 short shank m. c. cutters, 12 Brattie Brushes on 1/2" shanks. Will fit all electric grinders and band grinders.	\$1.50 P.P.	
FLEXIBLE SHAFT ONLY		
	\$6.50	P.P.
For all electric drills & hand power tools. 354" long. On a bearing. One of specially wound high carbon steel wire in flexible steel casing. Will accommodate tool shafts up to 1/4" dia. per inch. Electric drill, etc.		
2 DRUM SANDERS W. b. 12 Bands In Assorted Grits 1/2" dia. x 1" long on 1/4" arbor with 1/2" bands One drum 1/2" dia. x 1/2" and 1/4" arbor	\$1.50	P.P.
12 INDIA SILICON CARBIDE AND ARSENIC STONES Industrial Strength Triangles. Ab 4-6-8-10 mm each. Four each. 4" later triangles. A real 12 pc value. 12 for	\$1.00	P.P.
7 H.S. and carbon drills from 6" to 12" in length. Assorted sizes up to 1" dia. for drilling in hard to reach places. A set	\$1.95	P.P.
10 HIGH SPEED STEEL BEAMERS 1/4" dia. x 1/2" long. Taper shank or straight. 1/4" wide x 1/2" long shank. 10 for	\$4.50	P.P.
12 INDIA CUTTERS Wood, plastic or metal. Assorted in 1/4" dia. x 1/2" shank	\$1.50	P.P.
2 CIRCULAR SAWs. Open 2 1/2" dia. x 1/2" shank DW 1/2" dia. x 1/2" shank SAWBLADES. Various For cutting wood, \$1.50 P.P. plastic or soft metals	\$1.50	P.P.
20 PIECE SET WIRE CUTTERS from 1/2" - 10"	\$3.50	P.P.
16 ROTARY CUTTERS SPECIAL 10 PIECES Assorted wire cutters on 1/2" or 3/8" shanks Will fit all hand grinders. Ideal for cutting wire, etc. Complete No C.O.D.'s Catalog 10 cents	\$5.85	P.P.

SCHUPACK SUPPLY CO., 7331 COTTAGE GROVE AVE., BUREAU 5-34 CHICAGO 19, ILL.

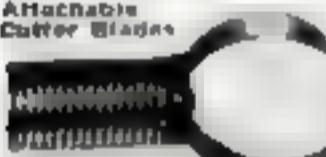
FREE

BOOKLET

**CLOGGED SEWERS
REMEMBER THE
COSTLY PLUMBING BILL.**



**Attachable
Cutter Blades**



**start your
business**



**Electric
Unit Cleans
pipes
3" to 12"**

Miller Sewer Rod, Dept. PR-2, 6846 N. Central Ave., Chicago 30, Ill.

Miller Sewer Rod is a registered trademark of Miller Electric Co., Inc., Milwaukee, Wisconsin. The "Miller Dog" is a registered trademark of Miller Electric Co., Inc., Milwaukee, Wisconsin. SINKS, BATHTUBS, TOILETS, LAUNDRY, FLOOR DRAINS. IT'S EASY TO REMOVE SEWER HIPS can be cleared of Slugs, Grease, Paper. Hand while Cutter blades can be used for removing roots. A new discovery in Swedish Made Wire gives the rod 100% torque flexibility.

Another new unit is the Miller Electric Rod or which has patented cutters that expand automatically to the size of the pipe. It will clean out heavy obstructions. In pipe diameters 3" to 12". Smaller sizes are available. But how much are these tools worth in COSTLY PLUMBING BILLS SAVED? Try this AD out and write your name and address beside it for FREE BOOKLET on Hand and Electric Units. Every tool uses No Agent will call. A post card will do it! Please call Phone Kildare 5-1702.

GUNK® degreasers

**At better
automotive
supply and
hardware
retailers
every-
where.**



Cleans engines, garage floors, power mowers, greasy walls economically and safely.
In aerosol or pour spout cans.

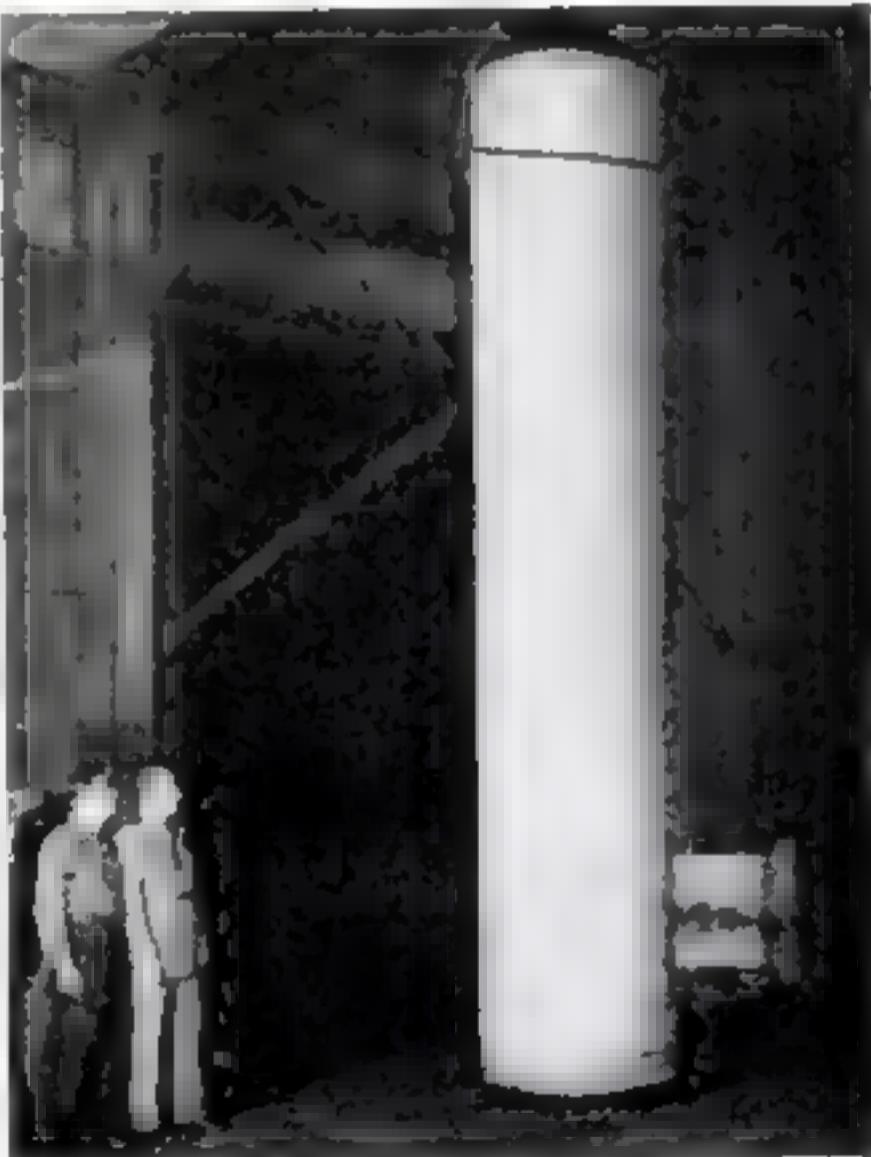
CHAMICAGO CO., River Forest, Illinois,
covering the Midwest and Southeast
RADIATOR SPECIALTY CO., Charlotte, No. Carolina
covering the East, Southwest and the West

O'Sullivan's Wonderful Lead Balloon
idea is to put into orbit a radar dish several miles in diameter. This would be ideal for spaceship communication, and it would be capable of picking up radio waves that cannot penetrate the ionosphere.

If some other civilization in space is trying to send us messages, we might be able to receive them with the monster radar screen.

Day after day O'Sullivan arms himself with a pad of paper, grabs a briefcase full of memos, and charges off to argue the possibility of still more "impossible" O'Sullivan ideas. Some of his proposals make people smile, but they pay attention, for 1,000 miles out in space is O'Sullivan's wonderful lead balloon—visible evidence that individual perseverance may be the most important element in a technological society.

Super storage tank



The huge aluminum storage tank in the photo above is said to be the largest casting of its kind in the world. It weighs 24,000 pounds, is 205 inches long, has a diameter of $38\frac{1}{2}$ inches. The big cylinder was produced at the Lafayette, Ind., works of the Aluminum Company of America for a maker of rocket propellants.

**DURO[®] PLASTIC**

**but a BROKEN HEART
and THE CRACK OF DAWN**
(Well, just about everything)

You've got a fix-it problem? DURO PLASTIC has the answer. DURO PLASTIC ALUMINUM, PLASTIC RUBBER, PLASTIC PORCELAIN REPAIR, Liquid STEEL, rust REMOVER, LOCK it, E POX E GLUE . . . and others in tubes and cans. Available at all better hardware, automotive, paint and variety stores.

In \$1.00 and 50c sizes (in Canada \$1.25 and 60c)



WOODHILL CHEMICAL COMPANY
Manufacturers of Plastics, Paints, Coatings, Inks, Adhesives, Sealants, Lubricants, Solvents, and Chemicals

GENUINE ALNICO **MAGNETS**

AMAZING, PERMANENT, NON-ELECTRIC, HIGHLY PRACTICAL. Conduct interesting experiments—Hundreds of uses. Attractive valuable steel items such as guns, pencils from fresh or salt water tools from tanks. GUARANTEED. Try Any Magnet one week. Money back if you are not well pleased.

No. 7-10 (Wt. 5 lb.)	1 lbs. part of 2-5 lbs. on steel block	\$15.00
No. 8-12.5 (Wt. 7 lb.)	1 lbs. part of 10-12.5 lbs. on steel block	\$16.00
No. 9-17.5 (Wt. 10 lb.)	1 lbs. part of 23 lbs. on steel block	\$17.00
No. 10-20 (Wt. 12 lb.)	1 lbs. part of 30 lbs. on steel block	\$18.00
No. 11-30 (Wt. 15 lb.)	1 lbs. part of 50 lbs. on steel block	\$19.00
No. 12-47 Hot Pad Magnets	10 lbs. for \$1.00	10 lbs. for \$1.00
No. 13-50	1 lbs. part of 100 lbs. on steel block	\$2.00

Bond M.C. or check \$2.00 postage. Carry on C.O.D.'s.

MIAMI MAGNET COMPANY, 3240 N.W. 27th Ave., Miami 42, Fla.

SMALL POWERFUL **ECONOMY TRACTOR**

Thousands in use. Used for complete details.

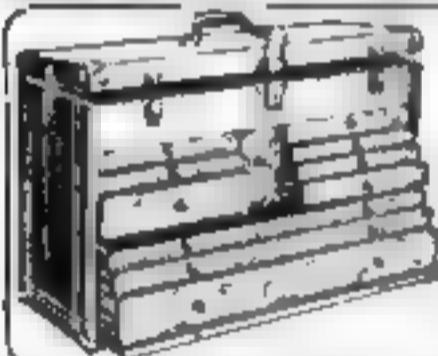
Engineering Products Co.
1005 A-2 Anoka Ave
Waukesha, Wisconsin

Unequalled value! Low price!
America's Best tractor. Ruggedly built. Easy to operate. 700 lbs. Hogg-Warner clutch, trans. and diff. 10 to 1 reduction. 40% more drawbar pull than ordinary tractors. 6 1/4 H.P. engine. 20 quick changes. Implements: HOOD, FENDERS.

Satisfaction

For half a century every Gerstner Chest has been sold with the guarantee it must satisfy its owner. Free catalog from machinists and toolmakers.

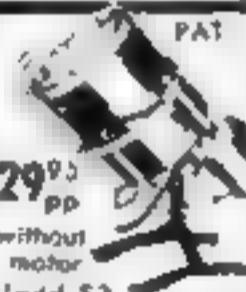
GERSTNER TOOL CHESTS
341 Columbia St., Dayton 7, Ohio



SAVE MONEY! - MAKE MONEY! WITH PORTABLE CEMENT MIXER!

It's easy, fast fun to do your own work with the MIKAL Mixer. Build barbecues, patios, sidewalks for yourself, for others! Mixes 3 x 8' sidewalk every hour! Uses any 1/4 HP motor. Thousands used by contractors. Try it on MONEYBACK without GUARANTEE! Send for FREE HOW-TO-DO-IT CEMENT MIXING BOOKLET. Dept. PS-2

MIKAL, INC., 2323 Ellis Ave., St. Paul, Minn.



Add \$1 W. of Rockwell

29.95 pp

Now any one can weld, cut, brace or solder almost any metal quickly, easily with this professional type welder. Make repairs at home or shop and farm repair, auto bodies and fenders, bond wrought iron furniture, railings, fences, etc.—1000 metal items. No previous experience necessary. Designed to operate on any properly wired 110 V. A.C. line. Order today! Literature on larger industrial equipment on request.

DYNAMIC WELDER COMPANY, 1808 S. Federal St., Dept. D3-B, Chicago 16, Ill.

Item 241



World's THRIFTIEST Light Plants

1900 Watt Plant (Item 42) same as Item 241 but larger

ELECTRONIC BRAKE RIDER Now Available On All Our Plants—With

HEAVY DUTY D-C ARC WELDER

with mounting

Range (Item 24)

for a little extra value

Welds 10 ft. Two 10 ft. Jumbo welding helmet

trade holder ground clamp

Bridle only with welder at

Send for our 60 page Catalog FREE with order. Prices Job Factory—Sandwich or MD.

MASTER MECHANIC MFG. CO., Dept. B 261

P.O. Box 389, Burlington, Wis. — or P.O. Box 66, Sandwich, Ill.

ADJUSTABLE

MITER BOX & CORNER CLAMP

3 TOOLS IN ONE

Adjusts to any angle

for mitre

or corner

or both

at once

or separately

or together

or separately</

World's greatest classified

opportunities

80 DIFFERENT
CLASSIFICATIONS . . .
P. S. SELLS TO ALL

AUTO TRAILERS

POPULAR SCIENCE MONTHLY
355 LEXINGTON AVE.
NEW YORK 17, N. Y.

Classified Ads only \$1.15 per word insertion, payable in advance. Minimum ad 10 words. To be included in April issue, copy should be in our office by February 20. No cancellations accepted after February 15. Address orders to O. K. Kelly, Classified Adv. Mgr.

1 AUTOMOBILES & MIDGET CARS

CLYMER'S Volkswagen Owner's Handbook New Revised \$1.00; Porsche Owner's Handbook \$4.00; Simca Owner's Handbook \$4.00; British Ford Handbook all models \$3.00; Metropolitan Handbook \$2.00; Renault Dauphine Handbook \$3.00; Model A Ford Album photographs specifications every Model A ever manufactured \$3.00; Maserati Owner's Manual \$4.00; Ferrari Owner's Handbook, all models \$4.00; New wonderful book 100 World's Finest Automobiles with specifications \$3.00; Maserati Classics \$2.00; Specials and Hot Rods of World \$3.00; King of Swapping tells all about exchanging engines all makes \$2.00; 1960 Index to sports \$500; Rare Yearbook \$2.00; Swap the Volkswagen for more power and acceleration \$3.00; Write free catalog Clymer Desk PB Los Angeles 4, Calif.

FIBER GLASS MIDGET CAR Bodies For Karts And Children's Ages \$7.50. Send For Pictures And Dimensions. Novelty Plastics, 4909 Midmoor Rd., Madison 4, Wis.

NEW 1964 Antique Automobile Full Size Data Is Burton Johnson Hubbard Park, Illinois

SWAPPING Engines, newly revised Tells how exchange all makes \$2.00; Clymer Desk PB, Los Angeles 4, California

T. Q. AND MICRO MIDGET Bodies Photo And Details 30c Blueprints \$1.00. Iron & Steel Co. Scenic, South Bend 10, Ind.

OLD CAR Magazine Free Sample Copy Pranson's Motor News, Box 1548, San Diego 12, California

HOW to Drive a Volkswagen Factory manufacturing methods. How to take delivery, overhauls, Troubleshooting tips. Questions and answers. Clymer's road testing in Germany includes proper handling technique of rear engine cars \$3.00; Clymer, Desk PB, Los Angeles 4, Calif.

CROSLAY or Foreign car parts catalogue Parts discount club Box 7, Elmont, New York

If you have a product or service which can be sold by mail order don't fail to read the new booklet How to Make Money Through Classified Advertising. Just send 10c for your copy to O. K. Kelly, Classified Adv. Mgr., Dept. 12, Popular Science Monthly, 355 Lexington Ave., New York 17, N. Y.

AUTOMOBILE Catalog and modern forego does ez books service manuals, glossy photographs, motor magazines Non-Profit organization. Write get on free mailing list Auto Maniacs O. Box 451 Mt. Clemens Michigan

OWN a Volkswagen, Renault, Porsche, Simca, Metropolitan, British Ford, Ferrari, Maserati, Ford, Chevrolet, Plymouth? You need Clymer's Owner Handbooks. Write for free catalog 700 automobile books Clymer Desk PB, Los Angeles 4, Calif.

2 AUTO SUPPLIES & EQUIPMENT

BUY Wholesale, Automobile Accessories-Merchandise Catalog 25c. Worldwide (12-BB) New York City 60

USE THIS HANDY INDEX TO FIND WHAT YOU WANT

Advertising Agencies for Advertisers	53
Events Wanted	4
Business Books & Indian Cards	76
Authors Service	92
Auto Supplies & Equipment	2
Auto Trucks	3
Automobiles & Midget Cars	3
Astronomy	2
Batteries, Generators, Etc.	4
Boats, Sailboats, Motors	11
Boat Building Courses & Schools Etc.	13
Books & Magazines	13
Boat Owners Organization	37
Business Services Information Name Lists	50
Buy It Wholesale	78A
Cameras, Photo Supplies	54
Camp or Camping & Tents	55
Car Cleaning, Maintenance, Cloth Ticks, Chalk Ticks, Glass & Greenery	56
Contests	46
Detectives	47
Gas & Oil	48
Hand Tools, Hammer & Pliers	49
Hatchbacks, U.S. Autos, Etc.	50
How to Get A Job Instruction	51
How to Trade	52
Industrial Supplies & Equipment	53
Investment & Information	54
Engines, Motors, Etc.	54B
Forums, Other Books & Magazines	55
Used Autos & Trucks	56
The Inventor	56
Job Seeker's Handbook	57
Formulas, Plans, Etc.	58
Government Services	59
High Grade Aluminum	60
Home Craftsman	61
Hobbies	62
Import Export	63
Jobs & Jobs Wanted	64
Investments	65
Jokes, Games, Notables, Etc.	66
Landscape Plants	67
Leads By Mail	68
Machinery, Tool Supplies, Etc.	69
Manufacturing	70
Markets & Previous Sales	71
Meetings	72
Model Makers Supplies	73
Model Ships, Boats, Etc.	74
Model Toys, Trucks, Etc.	75
Model Scale Models & Kits	76
Musical Instruments and Young Writers	77
Of Interest To Women	78
Old Gold, Jewelry, Watches	79
Patent Attorneys	80
Petrolina	80
Phone Records	80
Photo Publishing, Photography, Etc.	81
Postlets	82
Printers & Publishers	83
Printing, Mfg., Publishing, Etc.	84
Printers, Copy, Etc.	85
Printable Decorations	86
Radio TV Electronics	87
Razor Blades, Sharpeners	88
Refrigeration	89
Rubber Stamps & Office Supplies	90
Science & Chemistry	91
Seating	92
Shipping Goods, Guns, Fishing Tackle, Etc.	93
Stamp Sets	94
Stampless Stamps	95
Stamp Col. Returns	96
Surveying Instruments	97
Tattooing Supplies	98
Taxidermy	99
Tobacco & Pipes	100
Treasure Finders & Geiger Counters	101
Trees, Shrubs, Roots & Herbs	102
Tirewheelers & Other Machines	103
Wanted to Buy	104
Watch Repairing	105
Welding, Soldering	106

HYDRAULIC Jack repair kits—free catalog—free "Silent-Suspects" with each kit. Hydraulix Jack Packing & Tool Co., P. O. Box 50, Bloomfield, N. J.

JEEP Parts For Military and Civilian. At great savings. Largest inventory Catalog for owners and dealers. Inquiries invited. American Auto Parts Co., 1830-PB Locust, Kansas City, Mo.

TREMENDOUS Auto Accessories Book Thousands Do-it-yourself racing and racing ideas 25c deposit refundable. Newhouse Automotive Industries, 6400-PB2 Beverly, Los Angeles 22, Calif.

AUTO shop welding repair training in world's largest non-profit welding school. Low tuition. Free booklet Hobart Welders, Box P-21, Troy, Ohio.

JUST OUT New 328 page, Illustrated Catalog offering savings up to 50% on over 100,000 auto parts and accessories. Many hard to get Model A parts. All makes 1920 to 1961 model trucks foreign and sports cars. A. M. Karla and accessories, Hollywood accessories, custom styling. Hi-Speed Equipment. Send 25c for postage packing—refundable on first order. Whitney 1919 PB-2, Archer, Chicago 14, Ill.

PARTS Model A List 25c (Refundable). Metal Mart, Box 135, San Pedro, Calif.

230 NEW 'A' Parts List 10c Box 423, Belmont, Ill., Illinois.

RING-Valve job while driving. Car, truck, tractor. \$3.95. Unconditionally Guaranteed. Moto-Ru, P. O. Box 2024P, Ft. Worth, Texas.

STP Motor-Medic RX3 in bulk, seven Grant, Grantham 21, Penns.

WINDOW stickers, any state, 15c Rock and Decal, Newark 1, New York.

JUST OUT Ford Rocker Arm Oiler. Avoid expensive overhaul. Ford V-8 1954-60 292 Cu. in. engine complete—No machine required. List price \$11.75. Miller Engineering, P. O. Box 907, Maywood 6, Calif.

RING Valve job while driving \$4.00 postpaid. Guaranteed! Nothing like it! Last 100,000 miles. Moto-Ru, Grantham 27, Pennsylvania.

1959-1964 FORD Parts Illustrated catalogue 3c. Mark Auto, Layton, New Jersey.

BELT-Tite stops fan belt squeak. Sold everywhere. U. S. Polymer Corp., Rockaway, N. J.

3 AUTO TRAILERS

BUILD Expanding eight foot trailer. Accommodates five. Literature 10c. Pre-Mar Company, Wilmington, Massachusetts.

4 MOTORCYCLES, BICYCLES AND SUPPLIES

RECONDITIONED Motorcycle Motors. Chrome accessories. Complete stock Indian parts. Expert rebuilding. Fast service. Indian Motorcycle Sales, Kansas City 27, Missouri.

GO Cart less engine \$30. Eschenman \$55. Servicycle \$25. Harry \$45. Whizzer \$38. Engines \$4.50 up (Mail-order only). Send 25c (35c for First Class Mailing) for Directory-Catalogue Number 98 listing these and hundreds of other bargains in budget cars, motor-scooters, homebuilders parts, planes, etc. Midget Motors Directory, Athens, Ohio.

POPULAR SCIENCE OPPORTUNITIES

1000 MOTORCYCLE Bargains (Example) Motorcycles Less Motor And Parts \$14.95 Catalogue 20c. Bunker, 146-PG, Croydon, Virginia

PROTECT parked motorcycles from careless drivers. 100 reminder cards \$1.00. Stuart, 1875 Lenox Avenue, East Meadow, N.Y.

5 AVIATION

HELICOPTERS are our business, not our sideline. A-W. originators of homebuilt helicopters (not autogyro) sell more kits, less than any others. Complete Learn to Fly Booklet with 3 view drawings, complete prices, regulations, specifications, photos sent post paid. 25c. Adams Windmill Mfg. Co., Lakewood 13, California

AVIATION Surplus bargain catalogue One Dime. Box 2125, 1100 East 1st Street, Peoria, Illinois

PROPELLENTS. Plans, Kits, Supplies for Airboats & Subplanes 125 H.P. Lycoming Engine \$100.00 Prompt Delivery Catalog 25c. Banks-Maxwell Propeller Co., Box 3301G, Ft. Worth 3, Texas

AIRPLANE new book Modern Flight Four books in one, basic instrument, airplane maintenance \$1.00 Clymer Desk P.O. Los Angeles 8, Calif.

6 BOATING

OET Started In Boating: Special Boating Kit \$1.00 postage paid. Schweizer Aircraft Corp., 30 Airport Rd., Elgin, Ill., N.Y.

BATTERIES, GENERATORS, ETC.

BATTERY Repair Manual \$3.00 Satisfaction guaranteed. Bayer Publications, 888½ Betty Avenue, Neenah, Wisconsin

7 ELECTRICAL SUPPLIES & EQUIPMENT

ELECTRO-Berlitz Engraves all Metals \$3.00. Dept. M-2, 18311-C Springfield, Illinois 62703.

LAMP-Appliance parts wholesale. Fully illustrated catalogue 25c. Save money with Deco, 36 South 30th Street, Birmingham 3, Alabama.

LAMP parts Wholesale. Thousands of items for repairing, converting. Catalog 25c. Brown Lamp, Box 206-D, Clayton 8, Missouri.

UNUSUAL Electrical Devices. Wholesale. Literature 25c. Welco, Box 3464, North Hollywood, California.

AMERICA'S Best bending handbook. Bend conduit easily, correctly \$1.00 William Goforth, Box 3962-B, Santa Barbara, Calif.

8 WELDING, SOLDERING

WELDER, 110-220 Volts 1/2" \$29.50 Morris, 1870 Inner Drive, Schenectady, New York

MAKE torch at minimum cost cutting corners. Picture description \$1.00. John Deen Co., 101 Wash.

FREE Catalog Welders. Kits. Build 200 ampere welder using aircraft generator. 1000 25c. Dunbar, Minneapolis 8, Minnesota

9 MACHINERY, TOOL SUPPLIES, ETC.

FREE New Catalog showing only complete line of work holding tools available at where Dr. press vise, angle and swivel machine vices, rotary tables, production and heavy duty angle vices. 40 different models. Fully described with prices. Palmeron Products Co., 8346 South Chicago Ave., Chicago 17, Illinois

WORKER Metal Workers 30" \$17.00 Larger sizes. Benders, folders, shears. Free catalog Vyke Company, 2418 Jason, Denver 11, Colorado

TOOLMAKERS' Hole and Slot gauges. Campbell Tools, 1424 Barclay, Springfield, Ohio.

10 SURVEYING INSTRUMENTS

NEW And guaranteed factory rebuilt transits and levels made of cast, with purchase option. We will repair, trade or buy old instruments. Write for list P-21. Warren-Knight Co. (Manufacturers of Surveying Instruments), 136 W. 12th St., Philadelphia 7, Pennsylvania.

10 STAINLESS STEEL TANKS

STAINLESS Steel Tanks 24" x 48" 400 PSI \$200 value \$99.50. Size 8½" x 15", \$14.50. 1" pipe thread each end. Inaco, 1829 S. State, Chicago 16, Ill.

10 ENGINES, MOTORS, ETC.

DIESEL Injector Parts and Fuel Pumps Wanted GM-1-T-118. Mayer, 7126 Carnegie, Cleveland 3, Ohio

REWIND Motors yourself. Complete instructions \$1.00. Lewis Manufacturing, Howell 11, Mich.

MOTOR rewinders data manual and parts catalog \$1.00. Modern, Box 8715, Kansas City 14 Mo.

ANTIQUE 1893 C. Cretors & Co. engine 202 North Street, Topeka, Kansas

ENGINES On Karts. Wheels. Hard wear Catalog 25c. Lava Products, Danville, Illinois

ELECTRIC Motor Repair Men. request catalog motor winding and testing equipment. Motor Industries, Quincy, Illinois

11 BOATS, OUTBOARD MOTORS

NEW, used, rebuilt marine motors. Marine conversions, fittings. Free Catalog Stokes Marine Supply, Dept. 23, Coldwater, Mich.

PLANS cut to shape. Hull patterns. Blueprints 7½-38 feet. Big boat \$8.00. Small boat. Build a Boat Catalog of Naval and Fort-de-France Catamarans, Cruisers, Runabout, etc. 60c. Outboard Boats. Sailing, Racing, Powerboats. 50c. How to Build a Boat Booklet \$2.50. Equipment catalog \$2.00. Cleveland Boat Bureau, C. Dept. A-7, 111 West 4th, Cleveland, Ohio.

PLANS Kits. Plans of full size patterns for 20 inboards and outboards. Prepared for amateur builders. New 50 page illustrated catalog 50c. Glen Marine, 9142 Sherman, Bellflower, Calif.

BOAT Doctor. Build yourself or for profit. Complete plans, specifications, instructions for six different models. Send \$1.00. National Floating Dock Co., 1711 Gent, Indianapolis 3, Ind.

300 PLANS kits catalog. Previews \$1.00. Sailboat 25 cents. Marksmark, Box 101-P, Brighton, Mass.

11A GOVERNMENT SURPLUS

JEEP—\$275.00. Radio—\$2.45. T-70—\$1.75. Chains, Tools, Clothing, Typewriters. Typical Surplus Prices. Buy Direct List of Depots, Procedure. Full Details Only \$1.00. New York Enterprise, Wall Street, Box 402, N.Y. New York 5.

GUT War Surplus Direct From the Government - Airplanes, Boats, Jeeps, Trucks, Tractors, Helicopters, Walkie-Talkies, Radar, Mind. Send for Brody's U.S. Depot Directory & Procedures" \$1.00. Box 425-PB, Manhat, New York.

JEPPS \$275.00. Planes \$125.00. Boats \$7.00. Generators \$2.00 are typical government surplus sale prices. Buy 10,000 items wholesale, direct. Full details, \$2.00. Instructions and procedure only \$1.00. Surplus, Box 40743, Ft. Lauderdale, Florida.

12 BODY-BUILDING COURSES,

JIU JITSU & ATHLETIC

TRIATHLON

BUILD powerful arms, chest, shoulders! 21 exercises. \$1. Postage, Box 801-C, 1188 Market, Wilmington 10, Delaware.

STRONG finger flexes, powerful grip, strong wrists. New imported hand strengthener. 8½ palm pocket easily. \$1.15 each. Staten Island Sporting Co., Box 304, Staten Island 1, N.Y.

4 MUSCLE courses 25c (Guaranteed). Bid's System, PB-5, 101-C Evergreen, Southern California.

OUTSTANDING PHYSICAL Development! An All New Guaranteed Device. Use Only A Rope Strength Health, Muscle Gain-Reduce. Free Booklet. Ropercise, 4434-A Art, San Diego 15, California.

BARBELLS. Dumbbells. Courses. Apparatus. Booklet 10c. Good Barbell Co., Siloam Springs, Arkansas.

PUT MFD around? Don't take nonsense from bullies. Surprise them. Easy when you know Police Jiu Jitsu. Complete fully illustrated course in one volume as taught police and armed forces. Send \$1. now satisfaction guaranteed. Books Publishing Co., Amityville 30, New York.

BIG Muscles. The Quick Way! Dr. Young's revolutionary discovery. Free information. Gaynor, Box 8208-56, Chicago 30.

BARBELLS. Exercise Equipment Catalogue 10c. Reading Barbell Co., Reading, Pa.

FREE "How to Build a Uniform" Box 404, Box 424A, North Miami, Florida.

LOWEST priced barbells and barbellized body builders in America. Write Powerpak, Compass Avenue, Beachwood, N.J.

13 TAXIDERMY

FREE Book tells how you can learn Taxidermy and Taxining. Publishing profitable hobby. See 1 P-Stat No. 00 edition. Write Ace Mfg. Company, School Dept. 7442, Quigley 3, Newark.

14 FIELD GLASSES, TELESCOPES

DYNASCOPE Amazing world famous reflector telescope. Request free brochure Criterion, Dept. D-6-81 Hartford 1, Conn.

WAR Surplus Bargain! Millions of lenses, instruments, electronic, binoculars, cameras and complete line of astronomical telescopes. World's greatest optical market place. Send only \$1.00 for beginner's 3-lens kit and big instruction booklet Stock 2-CM. Write for catalog C-7. Pure Econ. Prod. & Service Co., Harrington, New Jersey.

FREE Catalogue! Thousands war surplus plus optics, bargains. Letters, Prism, Telemeter, Binoculars, etc. Solid \$1.00 for 10 lens Hobbyist Set and Project booklet. G. Jacobs, 661 West Merrick Road, Lynbrook, New York.

WINTER sale guaranteed model back binoculars Catalog free. Precision Importers Mercury Ridge, West Los Angeles 24, Calif.

CELESTIAL reproductions of observatory photographs. Free catalogue. Astro Mural, 337 West 90th St., New York 23, N.Y.

BUILD your own Reflector Telescopes. Complete kit. Mirror, Equatorial Tripod, etc. other accessories. Highest free illustrated literature. Criterion Manufacturing, Dept. KF-74, Hartford 1, Conn.

TELESCOPES. Binoculars — all sizes. Complete telescope makers supplies. Free catalog Buffalo Science, Mattituck, New York.

TELESCOPE kits direct from manufacturer. Other optical hobby kits. Large selection. Free booklet. Kaco Products, Oakridge, N.J.

REFLECTING Telescopem completely assembled. 6000 6x30. Observatory clearance. Free information. The Sky Scope Co., P.O. Box 58, Brooklin 28, New York.

ASTRONOMICAL books. Star charts free. 1000. Hebert Loft, 40-11 22nd St. 84, Flushing 64, N.Y.

HIGHLIGHTS Telescopes. 34 cameras. Terrestrial views \$1.00 up. Request for money-saving rates. Criterion, Dept. 29, Hartford 4, Conn.

15 SPORTING GOODS, GUNS, FISHING TACKLE, ARCHERY, TRAPPING

100,000 PRODUCTS Wholesale — Free catalog. Send postcard. Econ-O-Mart, Whippoorwill 16, New Jersey.

FREE Wholesale Catalog. Books on guns, gun parts. Gunner's World. J. G. Kirk, Pennsport, P.O. Toledo 14, Ohio.

BEND me your name and I'll tell you about a method that lets you take giant bass out of waters that other folks say are "fished out." Parts free. Write Eric P. Fair, Highland Park 34, Hillside.

10,000 GUNS! — Antique. Modern. Swords. Armour. Every description. Great Catalog \$1.00. Armament & Yachting 2-A, N.Y.

GUNS. All kinds. None over \$20.00. Bargain List 25c. M. Herk's, 8281 Gordon Drive, Sacramento, Calif.

3000 GUNS. Swords. War Relics. Catalog 25c. Smith Museum, Hennemont, N.J.

CROSSBOWS. Hunting bows. Factory Prices! Jayco, Box 1335, Wichita, Kansas.

POPULAR SCIENCE OPPORTUNITIES

JAP rifles altering American shells \$1.00. Jap shells \$3.95. catalog 10c. TP 5 op. West Branch 10. Michigan.

16 CAMPING EQUIPMENT & TENTS

CAMPING Equipment, world's largest selection. Low prices. Send 25c (print name—address) for complete catalogues of TENTS, CAMP & EQUIPMENT National Camp Sites Guide & Camping Handbook. Moran Tent 10-150 50th Ave. Long Island City 1, New York.

17 DOGS, BIRDS, HAMSTERS, RABBITS & PETS

RAISE Rabbits on \$500 month plan. Free details. White's Rabbitry Mt. Vernon, Ohio.

BABY Monkeys, Descented skunks, raccoons, snakes, many others. Free list. Thompson's Zoo, Clewiston, Florida.

RAISE Rabbits. Make Money Information and prices sent free. Write Johnson, 621 Kansas City 41, Missouri.

RAH IT'S New Zealand Angoras Chinchillas Literature, prices free. Grinnells, Edwardsville, Illinois.

HAMSTERS—Ideal Pets, \$2.95 pair. Free booklet. Jar-Pro's Hamstery, 1447 Apple, Muskegon 16, Michigan.

YOUR live chameleons and instructions on their care \$3.00 prepaid. Watch them change color. Key to price list 10c. Louisiana Biological Center, Box 236, Morehouse, Louisiana.

1000 BREED Mink Booklet. Farno—25c. Wettlaufer, Gravel Rd., Webster, N.Y.

18 EARTHWORMS, CRICKETS, FROGS

FREE Letters re Big money raising fish, frogs and bats. We teach you how to raise and sell profits today! Hybridized winners \$3000-\$5.95-\$5000-\$8.95-\$10,000-\$15,000 Profitable w/ raising and marketing instructions. Read our Life Magazine 8c Dec. 28 1960 issue Carter Park 12, Miami, Florida.

FREE Picture Folder "How to Make \$3,000 Year" Square or Back yard raising Earthworms. Oakhaven-31 Cedar Hill, Texas.

RAISING Earthworms for Profit. Make \$300-\$3000 yearly. Complete 16 illustrated 128 page manual. Earthworms After All! High raw meat value of the most profitable advertising media \$1.00 per pound. Money back guarantee. A no. Earthworms for Profit. Trade \$1.75 source—\$1.25. Both books \$3.00. Free literature. Instruction folder Shields Publications Dept. 4 P.O. Box 1, Inc.

\$1000 MONTHLY Possible, raising Earthworms At an Area's Back yard Business. Complete 16 illustrated Booklet explains raising feeding packing mark up. Send 25c. Oak Haven Farm-V. Willow Springs, Missouri.

19 FARMS, OTHER REAL ESTATE

CANADIAN Tax Sale Properties \$3.00 acre. Terms \$3.00 month. Pay cash. H. H. L. Lovell Ltd. 1000 Lakeside, Timber Minerals. Free information. Land Corporation 3700 D Bloor Street, Don Mills, Ontario, Canada.

PURE Blue 1/4 Acre Homestead in Florida. Private lake with country club privileges \$8950 complete only \$10 down & \$1.00 a month. One acre high dry, acre homesite in this 5 star resort development set in the Cactus Ridge among the highest dryest elevations of Florida. Ideal location on U.S. 41 only 2 1/2 miles from the Bay Springs Hwy 4 miles to Dunnellon. Home of World's Best Bass Fishing schools, churches, shopping, deep water boating, lakes right at the property. Free membership in private country club. Luxury homes. Hard paved roads under coast about. All for amazing low \$8950 price per acre. See map in one of Florida's largest homesite developments. For low cost living, retirement investment write for free color brochure plus 24 page booklet of facts, maps, photos no obligation. Send now to best rooming price rise. Ad50072 ZO Rainbow Lakes Estates Dept. FB-141, 319 Bayview Springs Blvd Ocala, Florida.

FLORIDA Homesteads high and dry near National Forest \$345 at \$10 monthly. Folder free. Winfree Verner Deardorff, Fort Lauderdale.

CANADIAN Tax Sale Lands average price five dollars an acre. Small town, men's Farm, Barber, Hunting and fishing camps, minerals. Limited number of properties. Write at once for free catalogue. Tax Sale Service, Room 411-H, 1172 Bay St., Toronto 5, Canada.

STROLL Healthy Camping Free 3448 Barnes is described 35 states. Established 81 years. Stratton Healthy 231 ZB Park Ave. Suite 200, New York 10, N.Y.

PLOR DA'S Greatest homesteader value. High dry, acre size \$395. No taxes or down. 3/8 month. Free photo. Dept. 619-D, Rainbow Park, Box 521, Ocala, Florida. (AD50072-2).

FLORIDA 3-acre tracts. Only \$10 month—\$50 down. Specular land w/ full roads—excellent capital gains opportunities. Free Map P. O. Box 140 Wood Broker, Fort Lauderdale, Florida.

CAROLINA Coast \$4 down \$4.40 monthly buy a large homestead 30x150 in beautiful Bolling Spring Lakes. Satisfaction guaranteed. 16,000 acres. 82 freshwater lakes. Free literature. Charlie Price, Box 200, just 2, N.C.

20 TREES, SHRUBS, ROOTS, HERBS

EVERGREEN Seedlings and transplants in leading varieties for Christmas tree production. Assorted ornamentals. Free catalog and planting guide. Packhouse Nurseries, Bagdad 14, Pa.

21 POULTRY & SUPPLIES

NEW Poultry Book 25c. Refundable \$4.00 to color pictures. Over 80 popular fowl varieties illustrated. How to can pictures included. Stromberg, Port Orange 37, Fla.

22 PROFITABLE OCCUPATIONS

INVESTIGATE Auto Accidents. Earn \$750 to \$1,000 monthly. More drivers involved needed. Car furnished, low car expenses paid. No college education necessary. No strings of any kind. Pick your own job hours. Meet interesting important people. We train you at home in spare time. You keep present job until ready to switch. Write for free booklet No. 1000. Liberty School Dept. 21, Liberty 14, Ill.

VENDING Machines. No training. Operate A Route of Coin Machines and earn Amazing Profits. 32 Page Catalog. Free. Payway Machine Corporation, Dept. 17, 725 Knob Street, Baltimore 3, Maryland.

FREE Letters Make Big Money Raising Frogs, Crickets and Crickets Carter 24-10 Park Ave.

FREE Picture Folder "How to Make \$3,000 Year" Square or Back yard raising Earthworms. Oakhaven-7 Cedar Hill, Texas.

INVESTIGATE Accidents. Earn \$125 week to start. Claim Investigators are urgently needed to investigate more than 400,000 accidents daily. Work full time for insurance company, railroad, steamship line, or government office. Or step into your own profitable spare time business. No experience needed. Free book. New Industrial Schools, B-2, Box 8227, Dallas 5, Texas.

BECOME independent with your own franchise business. Thousands earning handsome incomes. Request interesting facts today. National Franchise Reports, Y-528, 333 North Michigan, Chicago 1.

MAKE Money Writing Short Paragraphs, 1 Information Mart, Barrett Dept. C-86 B-A, 7484 No. Clark, Chicago 26.

SHARPEN 4000 pieces paper—new unique's Copper sharpener supplies Blackhawk Sales, Inc., Iowa.

FREE Book \$2.00 Successful Little-Known Businesses. Work from Home. Publishers, Brooklyn 4, New York.

23 BOOKS & MAGAZINES

GOOD Used Books. 50c-81. Free Lists Editions. Dept. PG, Hempstead, New York.

BRITISH Book Bargains. Any subjects Catalogues free. Transbooks, Wantagh 77, New York.

"PROPHET Elijah Coming Before Christ" Wonderful Book Free. 51 Megiddo Mission, Rochester 18, New York.

BOOK Disposals: 10 different including large issues \$1.33—\$3. Samples, something different 20c. Persit, 436 New York Avenue, Brooklyn 25, N.Y.

BIBLES, Books, Bargains, Free Literature. Price, 4813 Hurford, Chester, Pennsylvania.

BOOKS. The Money Question And World History Free Brochure. Omni Publications, Box 316, Hawthorne, California.

INEXPENSIVE Civil Service Home Study Guides. Details Free. E. Waters, Gibbesboro, N.J.

ADULTS Only Books Discounting See Variations. Free List. We hel Limited. Black Mountain 3, North Carolina.

ATHEIST Books. Catalogue free. Truth Seeker Co., 18 Park R, New York 8.

NATIONAL Geographic Magazines, Any Issue, 1888-1960. Periodical Service, Box 465 PA Washington, D.C.

SAVE 20% to 80% On Books. Free Catalog. Discount Reader's Service, 158-B-3428 Upland Way, Philadelphia 31.

BOOKS for Recreation, Education Profit Literature free. H. E. Haynie, 7848 Wynbrook Rd., Baltimore 34, Maryland.

1000 USED Books 0 To \$10 Off List Price. Werewolf Bookshop, Verona, Pennsylvania.

BOOKHUNTERS' All Subjects. Send Wahibah Jaber Book Service, 103 Hazelwood Drive, Westbury, New York.

100,000 BOOKS—10c Each! Astonishing Subjects. True Tales. Free Catalogs Bargains." 1323-MV Chaparral, Corpus Christi, Texas.

NEWSPAPER. American, complete original \$1.50. Dated in 1790's. Catalogue 25c stamps. D. R. Soalight, Bookseller, Tall Timbers 3, Maryland.

JUST Out Amazing new booklet "How to Make Money Through Classified Advertising." This booklet is must reading for all mail order men. It tells you what where when and how to advertise. Contains scores of valuable hints on having ads written copy advertising results etc. If you advertise now or ever plan to don't fail to read this booklet. For your copy just send 10c to cover postage and handling to O.K. Kelly Classified Advt. Mgr., Dept. 292, Popular Science Monthly 353 Lexington Ave., New York 17, N.Y.

ATT and Human Gene 10c. Illustrated 50c stamp or coin. Corridors Books, 320 North Paulina Street, Chicago 22, Ill.

MAZAZINES Wholesale-Retail catalog 10c Backdates, 1101 East Lombard, Baltimore 2, Maryland.

24 HYPNOTISM

HYPNOTIZE Self, Others while asleep with amazing hypnotic phonograph records. Catalogue free. Research Association, Box 24-G, Olympia, Washington.

HYPNOTIC COACHES. Catalogue. White Hypnotist, 1721 Sunset, Hollywood 48P, California.

HYPNOTISM Bellhypnotics. Guaranteed home study courses. Diploma. Send free brochure School Hypnotology, 1860 Central Park West, New York 21, N.Y.

WORLD'S largest catalog free Merlin Enterprises, 1244 Lincoln Avenue, Evanston, Ill.

FIRST Offer Scientific treatment on hypnotism job published. Write for more for less. Med. Box 663, Philadelphia, Penn.

FREE Hypnotism. Self-Hypnosis, Sleep-Learning Catalog! Records, Tapes, Books, Courses, Equipment. Drawer PB497, Rudoso, New Mex.

HYPNOTISM 23 lessons. Most complete course offered. Instant methods, everything! \$2.00. Guaranteed! Welchel, Limited, Black Mountain 17, North Carolina.

LEARN While Asleep (Method #27 Effective). Develop A Powerful Personality Control Weight And Tension With Electronically Proven Transitional Sleep Methods. Details Free. A.B.R. Foundation, Box 212, Henry Clay Station, Lexington, Kentucky.

HYPNOTIZE Successfully! "One Word," "Instantaneous," "Against Will" Methods Exposed. Complete Illustrated Course—Including Secret Nerve Pressure Technique \$1.00 Arthur Fowler, Box 430, Woodbury, New Jersey.

"HYPNOTIZE" One word. One super snap." on stage. Satisfaction—or refund. \$2. Hypnotister, Box 9308-86, Chicago 36.

POPULAR SCIENCE OPPORTUNITIES

107 DISTINCT British Colonial Stamps, 10c Approvals, Linstamp, St. Catharines 402 Ontario.

THREE-HR. Stamp Bureau, Israel, Iceland—Vatican Assortment—plus exotic triangle set—Also fabulous British Colonial Accumulation—Plus large stamp book—all four offers free—Send 10c to cover postage Empire Stamp Corp., Dept. PR, Toronto, Canada.

FREE—Mint British Colonies from British Government Issues, Negev, Negevian, Be'er Sheva, etc. Complete Negev, Tel Aviv, etc. 10c each. Free with approvals Viking Great Neck 8, New York.

DEALERS Wholesale Catalog, Postage &c, Francesco, 8031 Queensbury, Baltimore 15, Maryland.

QUEEN Elizabeth On Stamps. A booklet in color of 40 different stamps from 12 countries all bearing the portrait of the Queen of England. 10c with approvals. Capital Stamp Co., Pittsburgh 10A, March.

PRICE! Counter Triangle Birds Triangle, 25 others, 10c each. Magnolia Stamp, 2411 Hwy. Alexandria, Louisiana.

FREE! Helicopter Bird Triangles! Orchid Beauty! 25 others. Approvals. Griffiths, 28348 Thackeray, Hayward, California.

21,000 DIFFERENT stamps yours for only pennies a day on our systematic payment plan. Details free. W. Bloquist, 1415 Cherrydale, San Jose 25, Calif.

SUPERIOR worldwide selection. We are extending our value. New numbers \$1.65 Pound 43.00 Boxed. Yacht, 434-A Harvard, Montreal, 20, Canada.

EXCELENT service, fair prices, plus 20 beautiful bird and animal stamps yours for less. 10c. Stamps Company, Box 3160, Claremont, New Hampshire.

FREE Sample Interest in International Stamps and National Stamp News, Anderson, South Carolina.

KOCHENET, 1000 Different 10c American, Russian, 25 others. 10c Approvals. Mexico, Box 38-1224, Miami, Florida.

WORLDKOPUL, 1000 Different 10c American, 100 others. 10c Approvals. B-A-C Stamp Service, 114 West Washington, Bismarck, Iowa.

SINGELI Book Your 20c Man Free Post Card, Pader Pietro, 150 Miami, New York 30.

PENNY Approvals jammed with Bargains. 100 others. 10c each. The Puritan Stamp Company, Memphis, New York.

CANADA Three dozen new 25c approvals. 1000s more. 10c each. Montreal, Quebec.

U.S. Stamps, Giant Discount Catalog—20c Haynes, 37VX Maiden Lane, NYC 35. 20,000 STAMPS Mail Bargain Lot Including Packets, Sets, Rare Stamps, Gift And Free Imported Samples. \$1 Only Extra Special \$2 Giant Sellout Assortment 45 H.H. Vane Packet at Postage. 100 N.Y. Ave., Brooklyn 25, N.Y.

1500 STAMPS 10c On and off paper. Good variety. World wide. Many approvals. No approvals. 10c each. Satisfaction Guaranteed. Wanted. 1625 First Ave., Oak Park, Ill. Calif.

PRICE List U.S. Foreign No Approvals. Also 5000 Miami HI. Louis 8 Mo.

FREE! 25 Different New Zealand, colorful inexpensive approvals. Elkhart, Box 20, Elkhart, Indiana.

DANISH West Indies Stamp Free—Approvals. W-B Stamps, Wilkes-Barre, Pa.

OLD United Nations (retail 50c) free: Approvals. Teddie, Crystal Beach, Florida.

FREE Mint Set. Approvals accompany. Mintco, Box 737, Memphis 1, Tennessee.

FREE! 100 Different Worldwide collection. Approvals. Martin, Box 22, Tucson 2, California.

FREE—When Buying Our Exciting Approvals—We Give Valuable Packets, For Complete Purchases. Also Scotia Albums Catalogues Etc. Tru-Value, P.O. Box 2000, Santa Ana 2, Calif.

100 OLD U.S. Stamps between 1901 and 1935 \$1.00. Roach Stamps, 61 Chestnut Mansfield, Ohio.

NOW! 47 Selected Portugal. \$1.00 to approval applicants. Iray, Box 114, Allston 24, Mass.

100 FOREIGN, 20 U.S. Commemoratives. 10c Approvals. Weckerling, 8030 Orange, Westaco, Texas.

PRICE! 25 Large Handbags Approvals. Bel-Air Bag Co., Inc., Park Mich., 20.

FREE U.S. price list plus packet list. Thom, 4848 15th Avenue, Minneapolis 17, Minn.

25 DIFFERENT Commemoratives 10c up 10c. U.S. Approvals. K & B, Box 20, Brooklyn 23, N.Y.

TANGER Animals. Cook Island. Ten Different 10c Approvals. Sadler, 2308 N Evergreen, Phoenix 8, Arizona.

KOHEA! 25 different 25c with a prov. 10c. Mission, 4224 Midview, Denver 1, Colorado.

40,000 VARIETIES available on approvals of U.S. Stamps. Box 233A Dept. Pin, 20.

1000 DIFFERENT Worldwide 10c. With approvals only Jacobson Compound, New York.

SCREWBALL Fish in Natural Colors. Fan the Fish Man. Fergo Mother's Day. Crayon Bugs Set French Model. Somalia Flower Garden, Jets. Others Free while purchasing approvals. Stamp Farm, 8, 11 Oxford, W. Va. 26041.

BARGAIN! 100 Different Sweden. 25c Approvals. Carling 2, D-201, Howard City, Michigan.

FREE Pictorial Stamp on 1st Premium Approvals. Danco, 11-14 Mainland, Can.

TRADE your duplicates toward our approvals. Foreign and 1 Complete Collection. 10c. Safety Glass in Box 90-5 New 40 Highlands, 41, Massachusetts.

SPAIN'S Christ Nude stamp 25c. Approval Royal Stamp Company, Tarragona 3, Spain.

40 DIFFERENT U.S. (30 Commemoratives) 25c. No approvals. Goldenberg, Aspinwall, Pa.

14,000 DIFFERENT! Among new plan issues your collection systematically country by country. One 50c weekly. Free details. L. G. Ware, Stepster 70, Conn.

GIANT Approvals Thousands! Different 10c and 25c each. Wahl's Stamp Exchange, 1000K Pleasant, Orange 21, N.J.

FREE! Five Different Packets. Adult Approval Approvals. Jorge, Ho-Ho-Kus N.J.

U.S. Mint Flag set, complete. \$1.00 Free Post. Brooks, 2221-T Avenue X, Brooklyn 23, New York.

500 MIXED U.S. Various Issues. Mr. Monje, Fairmount, Cincinnati 14, Ohio.

10 BRINGS you \$1 different U.S. with the U.S. approvals. Stamps, Kennebunk, Maine.

FREE—Everyone you buy our exciting approvals. You receive absolutely free stamp reviewing your purchase. West Coast Stamps, Santa Ana, California.

MINT Set Triangular and 200 c. Hebert—25c. Approvals. Abbott, Box 242A, Jamaica 21, New York.

THRENDOUS accumulation. Collections. 100s intercalated. Cleaning out cheaply. Lots free. Astoria, Marmad, Mass.

FRENCH Colonies—6 beautiful sets. 10c with approvals. Bennett, Condor 2, New York.

PENNY Approvals. Regardless Catalog! Kloster, 4104-Mind Cl., San Diego 5, California.

1016 DIFFERENT \$1.00 with approvals. Klondike, 603 Jefferson, Elgin, Illinois.

FREE—Any volume Scott's International Albums. Scott's 1961 Catalogues, even Master Global A book free when you buy our sensational foreign approval Bargain Stamps. Redlands 2, California.

1000 PINE Mixed United States Stamps 25c. Wright's, Box 3122, Hazlewood, Maryland.

FREE! Beautiful Stamps Gold Silver others. Approvals. Delco, 30328 Westphalia, Detroit 8, Michigan.

25 QUEEN Elizabeth 10c Approvals. Van, Box 911, Columbus, Mississippi.

TRIANGLE Collection—Twenty-Two Different. 10c. Approvals. Valley's, Box 4148, Spring Valley, California.

100 DIFFERENT Belgium Free to adults requesting approvals. Includes L.P.U. 8, 10c, 15c. Full Railroad stamp, Taylor Brookline, N.Y.

POLYNESIA and Czechoslovakia. Rock & Box. Cineca (Nikola) Israel 10c. 10c and 15c. Birthday 10c. Also albums rates. Write our approvals bureau. Best stamp service. PSB Box 200, California.

CROATIA Infantryman, Flies, Warships, Tanks—Free Approvals. William Deems, 226a Race, Ravenswood, West Virginia.

FINE U.S. Air Mail on approval Wilder Stamp Co., Cape Porpoise, Maine.

UNITED STATES, Canada, British Colonies. Quantities Approved Catalog and Retail over \$1.00 \$12.00. Worldwide New Customers. Fortune 10c Postcard. Box 31, St. Paul 2, Minnesota.

29 ANTIQUES, RELICS & INDIAN GOODS

SELLING 300,000 ancient Arrowheads, Spearheads, Tomahawks, etc. List free Leaflet, steel wood, A Banquet.

30 MINERALS & PRECIOUS STONES

GET Free Catalog no serious rockhound, gem cutter, jewelry maker, hobbyist or Craftsman can be without full of bargains, exclusive items, low prices from largest suppliers and authorities in the field. Free new catalog just off the press—Write for the catalog. Write Siriger's Dept. C 14, 1433 S. Walnut Pasadena, Calif.

EARTH Science—Rockhounds National Magazine Subscription \$2.50 Sample 25c Box 11-17, 24, Chicago 100-311.

NEW MEXICO U.S. and Foreign minerals lists see Marlow, Winston S., New Mexico.

JEWELRY Parts Catalog Free Rock Craft, Temple City 16, Calif.

FREE bargain gem lot. Lapidary and mineralogical catalog 54 pages 25c O'Brien 2, 1116 N. Wilcox, Hollywood 28, Calif.

HIGH-FLYERS Clean Minerals Catalogue—same \$1.00-42 Waycross, Milwaukee 22, Oregon.

31 HOBBIES, COLLECTIONS

INVENTING can be an interesting and profitable hobby. Write for complete particulars. Institute of American Inventors, Dept. 20-2, 830-P St., N.W., Washington 4, D.C.

FOREIGN Military Medal with ribbon, only 50c. Enamored Medal, \$1.00 Catalog 25c Hobbes, Box 21, Rockaway Park 24, N.Y.

WANTED—Cigarette Tobacco cards. White Charles Gray, East Bangor Pennsylvania.

COLLECTING Over 1,000 sets. Including Civil War, Roman, Knights, Maltese Cross Catalog \$2. 15c Smaller Box 147-2, Waukesha 78, Mass.

COLLECTORS Matchbook covers 100 Different unused \$1.00 Catalog 25c Album \$3.00 Charles Edelman, 1811-P East 84, Cleveland 1, Ohio.

32 PHOTO FINISHING, PHOTOCOPIES, ETC.

A Triple Value—Quality Price Service. Color or Black & White 12 exp. Black & White—35c 20 Gift Photos—\$1.00 Holiday Photos, Dept. 17 Box 666, Denver, Colo.

THIRTEEN Exposure rolls 40c. Wallets 20 for \$1.00 Lincoln Studios, Dept. L, Box 12, Lincoln, Nebr.

A 2 in 1 Value—Price Quality Service. 20 Gift Photos—\$1.00 12 exposure rolls Black & White 15c Color or Black & White Interstate Photos, Dept. 12, Box 13, Aurora, Ill.

INTRODUCTORY Special Processing Kodakchrome Photo Movie or 35mm 20 exp. \$1.00 Kodachrome 3 exp. complete \$2.00 12 exp. \$3.00 Black and white 8 number 40c Jumbo Reprint 10c Quality guaranteed Photo service. Write for free mailer Post X Photo, Dept. PB-2, Box 1A, Jersey City, N.J.

ROLL Developed 4x6 or 4x4 prints 8 exposures 50c 12, 70c 3x7 prints 8 \$1.00; 12 \$1.50 Wagner, 1918 West Columbia, Philadelphia 23, Pennsylvania.

POPULAR SCIENCE OPPORTUNITIES

PLATE Baby Shoes, Jewelry, Gifts, Bronze and colored pearl. We finance. Free booklet. W. Johnson 11029 South Vermont, Los Angeles 44.

\$1.00 BRINGS You \$15.00 Spare-Time Home-Business opportunity! Amazing new velvet-spray transforms old couches, lamps, TV-radios, figurines, furniture, etc. thing into \$500.00 or more free samples. \$2.00 Business Plan. 100% No Money Down Kraft NY Los Angeles 41.

IMPORT-EXPORT opportunity in profitable world wide mail-order business from home without expense of travel abroad. Established world wide ships to countries for no tax advantage. Profits are unnecessary. Free details. Memphis 1882 Los Angeles 24.

\$70 WEEKLY Home spare time. Simplified mail bookkeeping immediate income—easy! Auditax, 34787D, Los Angeles 24.

INCUBATION New Table Top Machines manufacture over 15,000 saleable products. Also laminates, encases, molds and plates in bronze, chrome, or copper. 200 models. \$10.00 info. Free Confidential Details and Home-Business Plan. Plasti-Form, Dept. PS-2, Gardena, Calif.

NEW Home-Import Mail Order Profitability! Your mailbox stuffed with money! No selling. No experience. No investment. We supply everything. Free Details. Mail Order Distributors, Import Division, Dept. CEC-C 15201 South Broadway, Los Angeles 2, Calif.

VENDING Machines—No Selling. Operate A Home or Office Machines And Vending Amazing Profits. 32-Page Catalog. Free Parkway Machine Corporation, Dept. 18, 718 Ensor Street, Baltimore 2, Maryland.

INTERIOP Reteaving, \$3-\$10 per job possible rewards by the hour. No holes. Spare-full time. Free details. Mill Weave, Dept. 107, 122, 223 W. Madison Chicago 4, Ill.

MAKE leather weekly profits copying news, over 1,000 of publications. Reproclippings worth \$5.00 each. Particulars free. National, 81-PB, Knickerbocker Station, New York City.

MONEYMAKING Franchise can be established for free for any franchisee. In addition, Write Popular Newsletter, 1000 N. Clinton, Chicago 6.

WORLD'S Easiest Mailorder Business, Completely explained. Published especially for beginners. \$1.00 or less. Mr. H. Tasker, Shamokin, Pennsylvania.

PIPER HANFORD contact us. Practical Businesses. Box 1001, Ft. Lauderdale, Fla.

DOLL\$! Dolls! Dolls! We teach you to repair, make, sell all kinds of dolls and doll repairs. Starting today. \$100 at home. Learn while you learn. Free catalog. Doll Hospital School, Studio PSC-21, 11826 San Vicente Blvd., Los Angeles 46, Calif.

MAIL Order home business. Get Free Copy, "Make Money in Mail-Order" Mail-co. 1717 Westwood, Dept. TSP2, Los Angeles 24.

LEARN Landscaping And The Growing Of Plants. Start A Profitable Business Part Or Full Time. Free Information To Start Operation. Mail Mail 14 hours a Day, 100 Dey, P.O. 31, 117th Main Street Blvd., Los Angeles 34, Calif.

LEARN Professional TV Servicing in one week! Fabulous new simplified system. No big expense. No studying. No tools or equipment. Spare, full time. Own your own big profit business! Save! Amazing but true! Free! Write, TV Systems, Dept. EC 142, 1824 So. La Brea, Los Angeles 19, Calif.

GROW Orchids At Home! Profitable low rating B. usual home growing ex. but no sprays, hot temperature and humidity conditions. Orchids need. Free—full details plus 3 m. w. & be option to Orchidian magazine. Orlando, 100 S. Vermont, Los Angeles 4.

EARN Good Money Sharpening Scissors, Saws, Tools, Cutters. Free Manual. Treco, N. Tonawanda 1, N.Y.

\$100.00 WEEKLY space room. Raise red worms billion way. Odorela, Charlie Morgan, Box 140, Bushnell, Florida.

YOUR own business \$300.00 stock required. Dickman, Box 301, Margaretville, N.Y.

PLASTERCRAFT molds, liquid rubber, plasters, look candle soaps. Catalog and manual free. Jayhawk Plasters, Blue Rapids, Kansas.

BUSINESS Kit Free! Postcard puts you in business. Complete line 230 shoe styles. jackets, New Denim to go. Big Com-
munity No investment. Send for Free Kit. Mason, Chippewa Falls K-365, Wis-
consin.

AMERICA'S leading franchise firms are listed in the new 1961 NFR Directory of Franchises. Use it as your guide to franchise profits. Send one dollar today. National Franchise Reports, DB-526, 222 North Michigan, Chicago 1.

PACK AND At Home for Profit. We supply you No child, heavy market. Free home business idea. MPC 2213AA, Java Street, Los Angeles 20.

\$10.00—Operate own Fix It Shop Service household appliances, motors, mowers, lawn, skates, etc. Free Book. Christy Trades School A-301, 2214 Lawrence, Chicago 25.

SELL Books by mail 600% profit Royal Books 344 M. St. NW 21, Ohio.

PENNSYLVANIA No One Amazing Profit. Pawnbroker, Western Ave., Bath, Maine.

\$1.00 "WYFK" writing name. Sample size pen, paper, etc. reconditioned. Cook Martin Auction, Saratoga Springs, New York.

GUARANTEED Market Raise fishworms for us. Free details. Lovers' Farms Lubbock 11, Texas.

START profitable business in rich undeveloped area. Information free. Business 629 South Conception, Mobile 27, Alabama.

IMPORT-EXPORT. 20 lines offered. Substantial income opportunity. Individual setup service, not just instructions. Huron 102 West 42, New York City 16.

\$1.00 brings you "216 Cartoon Models." Make \$10.00 a cartoon in your spare time. Know what to draw and where to get it. One page back to a New Model. Dept. 101, 11000 Latitudine, Dept. 24, Ft. DeRat.

BUY Government Surplus cheap. Resell at enormous profit. Latest Directory and procedure \$1.00. Aviation Surplus, Box 589 SB, York, Pennsylvania.

MAKE durable building plastic easily. Waterproof, fireproof, economical. May's Lumber, 111 Chile, Arizona.

UPGRADE profitable mail order business. Write Welchel Limited, Black Mountain 2, North Carolina.

MAKE \$100 from square foot. PL wood, 1x4 or 1x6. Free Details. Woodwards, B. Lorraine, Mass.

WANT to eat cash crop working for you. Write Gardner, Asheboro, N.C.

WANT Your Name with 1000 Masters? 2000s. 100 year. Duke Masters Kart, North Carolina.

SELLABLE Big New "Home Mailorder Folio. Literature Free. Fundy Importers, Box 307-S, Yarmouth, Nova Scotia, Canada.

FREE Book "100 Successful Little-Known Businesses" Work home! Plymouth-4377, Brooklyn 4, New York.

SELL, Champion AC. Auto air spark plug. New. Reconditioned. Electric and Gas. \$10.00 down. 100% profit. Free sample. Lee Paugh, 1000 E Roberts, Houston 2, Texas.

DIRECTORY of Drop-Shippers waiting to work under your label \$1.00 Books Unlimited, East Bridgewater, Mass.

FREE unusual do-it-yourselfing newsletter reporting amazing income ideas. P.O. Box B, Box 4324, Los Angeles 3.

MAILORDER Profits. Guaranteed Copyrighted Literature Industries, P.O. Box 3620, Pittsburgh 7, Pennsylvania.

BIG Profits. Selling Exotic Imported Dates. 14 Free. Davis, 1204-B Alamo, Anaheim, Calif.

EMPLOYMENT Information in big Mail Order Business. Make up to 100% profit. Free information. International Reports Dept. 4N Box 621, San Jose 6, California.

MOTEL-RESORT Management — Qualify for hundreds fascinating, leisurely, well paid executive openings. Learn at home. Free booklet. Motel Management Training School, P.O.-B, 612 S. Berendo, Los Angeles 5.

BAKE New Creations Doughnuts in Kitchen. Sell stores. Free recipes. Summers, 3906 South 15th, Minneapolis 7, Minnesota.

CAN Offer you best proposition on earth! Quarter brings part-time. Cash prizes! Quo or back if discontinued. Owner Dr. Quinn, Inc.

MOLD Statuary Pottery Tiles, Novelties—5¢ materials makes dollar selling! Particulars free. Marbleizing Service. Edna G. Davis, 1 Brown.

MANUFACTURE Fishing Lures. None better. Start now, send \$3.50—35 Samples complete. Quaker Lure Manufacturing Company, 2514-24 N. Lawrence, Phila. 46, Pa.

MARKETS Everywhere! Make artistic concrete bird baths, pottery. Best coloring. Home market or high end various. Free Lureco H. V. Wood Cementers, 4327 N. Highland, H. Ward 46, California.

\$200.00 MONTHLY Spare Time with Tax-free Hardware or Jewelry. Write Harbor House, Box 1423 B, Vancouver, Wash. 451.

\$1.00 WEEKLY make mailing rates. Ram 2317M Marshall, Chicago 28, Ill.

WHY thousands fail in Mail Order. Years of knowledge, secrets, pitfalls revealed. Write Mo, 146 Washington, Dennis, 3, C.C.

CASH from Sawdust. To-Can News-papers. Over 200 methods. Instructions \$1.00. Charles Company, 43-UPE, Norwood, Ohio.

L-1010 Making Rubber. Free Sample. Sherrick Supplies, Chaney's, 1907-C Kent Road, Jacksonville 11, Fla.

CRUNCH Popcorn and Potato Chip Equipment. Eakin, Box 933-B1, Springfield, Ill.

AMAZING Profits—\$150.00-\$300.00 weekly—no cost! Free details. Bayuba, Box 21, Cambridge, Maryland.

BUY Direct From Manufacturer. Novelties, hundreds of makes. Free Catalog. Venice Plastic & Lamination Service, 610 Broadway Ave., Venice, Calif.

CREATE home Mail order Business. Vincent Distributors, 4444-B Ute, San Diego 17, Calif.

NT Cast your talents into new latest achievements. Battery Laboratories, Bayou LaBatre, Alabama.

PIANO Tuned & learned quickly at home. Tremel 1000, 100 Musical Education unnecessary. Information free. Empire School of Piano Tuning, Champaign, Illinois. Checked 1733.

YOU too can make money through Popular Science classified advertising. If you have a product or service which can be sold by mail, send now for the amazing free booklet. How To Make Money Through Classified Advertising. It's short and of valuable information. Unlettered email order form and a lot of how to's. It tells you what, where, when and how to advertise. For your copy just send 10¢ to cover postage and handling to O.K. Kei Classified Adver. Mgr., Dept. J-72, Popular Science Monthly, 334 Lexington Avenue, New York 17, N.Y.

\$200 BRINGS booklet and plan for home sparetime business. \$200 monthly possible. D & H Enterprises, Dept. PB12, Box 344, Av. Albertson, L.I., New York.

COLORIZED Concrete pottery made without molds. Patented method. Ceramic products. Dishes, tiles, Basements, wall hangings. Money making projects. Booklet details free. Men's 44, National Potteries, Grand Rapids, Minnesota.

OPPORTUNITY to earn \$15,000-\$30,000 annually. Franchise protected. Operated on \$2,000 basis. Live at home. No merchandise to buy. Seller in rd. One of most exclusive and most competitive Businesses in United States and Canada. Send for free explanatory booklet. Warren and Company, Box 8-D, Louisville, Kentucky.

MAKE Pictures. Rubber for Molds. Extra Thick. Free sample. W. Wooley, 200 S. Laube Peoria, Ill.

B-O 10-11, Lee 10 to operate auto and truck service yard. Write, Box 306, Marion City, Iowa.

37A INVESTMENTS

INVESTORS Try the "Growth Stock Selector Guide" 24 topics. do it yourself. Market Service, Box 101, Nutley 18, N.J.

POPULAR SCIENCE OPPORTUNITIES

38

MONEYMAKING OPPORTUNITIES

FREE Literature—Make Big Money Raising Fishworms and Crickets Carter Farm II, Paines City.

START Big Pay business at home. In spare time. No experience needed to open a full table top machine for broaching baby shoes. Make \$6.46 profit on every pair. Full particulars free send postcard to: Mayor, 102 Jarvis, Room CM 3-A, Chicago 26, Ill.

DETECTIVES—Work Home—Travel. Experience Unnecessary. Detective Parcels free. Write Waggoner, P 125 West 36th, New York 24.

VENDING Machine—No Selling. Operate A Route of Coin Machines And Earn Amazing Profits. 32 Page Catalog Free Parkway Machine Corporation Dept. 19, 715 Kinsor Street, Indianapolis 2, Indiana.

EASY to start rubber stamp business at home in spare time. Make up to \$9.60 an hour without experience. Facts free. Write to Roberta, 1512 Jarvis, Room CR-3-A, Chicago 26.

MAKE fabulous weekly profits clipping newspaper items for publishers. Some clippings worth \$5.00 each. Particulars free. National, 41-PB, Knickerbocker Station, New York City.

MAN—Women! Start Money-Making Plastic Laminating Business at home in spare time. Material that costs 10¢ brings in \$2.50. No advertising or selling but mail orders bring in \$20. a day. Write for full particulars free. Mail name on postcard to Warner Room CL-3 A, 1512 Jarvis, Chicago 26, Ill.

KARN Extra Money Now. Take orders for new magazine subscriptions. Friends and neighbors are your prospects. For new prints and pleasure write now for more facts free to McGregor Magazine Agency, Dept. 110M, Mount Morris, Illinois.

PLATE Baby Shoes, Jewelry, gifts, bronze and colored pearl. We finance. Free booklet Williamson, 11029 South Vermont, Los Angeles 44.

EASY to earn extra money. Free 100 page catalog Tandy Leather Company, Box 781, A-40, Fort Worth, Texas.

A Second Income From Oil Can End Your Toll. Free booklet and Oil Field Map. No obligation. National Petroleum 517 PB-Paham Building Miami, Florida.

AMAZING increases in cash from one because of new travel or home territory. Information listed. National Franchise Report, EP-628, 323 North Michigan, Chicago 1.

MAKE Money Writing Short Paragraphs! No tedious study. I tell you what to write, where and how to sell; and supply list of editors buying from beginners. Many small checks add up quickly. Write to sell right away. Send for free facts. Bennett Barrett, Dept. C-44A-6, 744 Clark, Chicago 26.

MAIL Books & information free. Complete Lake Superior Mail Farm Bureau, Keweenaw, Michigan.

SHELLCRAFT Supplies Highest Quality Lowest Prices. Large Catalogue 25c. P.O. Box 2, Florida.

MAKE \$5,000 yearly—use car to think chinchillas, etc., etc. Free booklet reveals profits. Write P. O. Box 548 MI, Florida, 10411 Broad St., Ft. Lauderdale.

TRIFF Furniture pieces. Painted furniture \$1.00. Omega PS-22. Sasekenkunshu, Japan.

MAIL Trade Magazine Has Many Making Opportunities. Sample see Donovan, 78-28 Greenbelt, Levittown, New York.

PURNISH Names—Earn Commissions Hartford, 127 Highland Station, Denver, Colorado.

NO Gold Mine but dependable spare time profits. Free Details. Mahcoa, Dept. A, Box 154, Chittenango, New York.

IN 1952 I was unemployed, broke. Today own \$18,000 home, drive Cadillac, have bank account. Anyone can do this. N. Cole 217 West 49th, Bradenton, Florida.

MAKE \$3 hour sharpening scissors. Details Free. P. O. Box 2741, Rule Snow, Port Worth 18, Texas.

EMERGENCY Start any car without ignition key, guaranteed. \$1.00 P. O. Box Engineering, 1127 Avenida, San Jose, California.

TYPING—Home sparetime. Refundable course cost \$10.00. 50¢. Interstate 2-7-9 Beach 4-04, P. O. N. Y.

WANTED Men wanting to make money in spare time. Write Taylor Enterprises, Box 1, P. O. A.

OPERATE Profitable Mailorder Business. Write G. G. G. Raden, 3429 Denison, Hamtramck 12, Mich.

MAIL Order made me rich! Success series. Free. W. E. President, Mail Order Co., Inc., P. O. Box 100, New York 2.

LEARN Typewriter Repair at home in spare time. Cash in on 25 million typewriters breeding repair service. Learn as you learn. No special skills needed. Send for free facts on Home Study Course Modern Typewriter Repair Institute Dept. T-201, 4820 W. Third St., Los Angeles 3, Calif.

SELL, PROFIT! Fast sellers. Write Mos. 146 Washington, Denver 2, Colo.

LEARN Auto Upholstering, body-fender repair and painting at home in spare time. Cash in on 40 million cars needing body fender upholstering repairs. Easy as 1-2-3. Send for free facts on Home Study Course Modern Auto Body Institute Dept. 10 A, 4820 W. Third St., Los Angeles 3, Calif.

HOME workshop project. Operate spare time business. Free details. Laughlin Specialties, 1939 West 44th Ave., Vancouver 13, B.C., Canada.

38A BUY IT WHOLESALE

LARGEST Wholesale Supply Sources in U.S. Get free catalogs. Furniture, clothing, appliances, autos and accessories. To 100,000 item line. Housewares hobby supplies. Free details. Associated Wholesalers, Box 2758 C, Street C, 6, Iowa.

NEW Deluxe Motor car below wholesale price. Catalog. Automobilia catalog and others. Housewares, apparel, telephones, freezers, washers, dryers, television tubes, turntable, washing machine, television, phonographs, records, cameras, projectors, tools, typewriters, radio, jewelry. Name brands. Huge discounts to 70%. Poweraid Seibyco Dept. 4, 1 Illinois.

FREE Modes Starting Catalog. Burlesque and news. Discounted equipment and tools for the hot spot. Write Dept. 10, factory, White Club, 1120 South Webster, Chicago 6, Illinois.

WORLD'S LARGEST Wholesale Supply. Buy from PTA Amer. an European. Japanese Wholesalers. To 300,000 outlets. 100,000+ 125 different products. Rock bottom prices. Free details. International House, 316-PB, Jackson, Chicago 6, Illinois.

NAME Brands. Watches, Cameras, audiences, everything. All wholesale. Catalog Inc. Welch, 23-P, Fenway, Boston 15, Mass.

CATALOGUE General Merchandise \$1.00 refundable. Wholesale Catalogs, P-2500 North 12th Street, Milwaukee 3, Wisconsin.

PLAY Wholesale Catalog \$1.00 refundable. Write Dept. 10, Newark, N. J.

SAVE Thousands of products and services Wholesale. Write Mos. 948 Washington, Denver 2, Colo.

100,000 PRODUCTS Wholesale! Terrific! Be Rains! United Wholesalers, 1245 Broadway, New York 1, N. Y.

ELLECTRIC Clocks, radios, etc., etc. Wholesale. Free Catalog Carrin, PSW, Cotina, California.

38B IMPORT-EXPORT

SWITZERLAND Watches Direct to You. \$5.00 and Up. Example—17 jewel water proof radium dial sweep second calendar \$10.40 Catalog 25c, deductible from order. Guaranteed. Seaway Traders, Box 705, Cleveland 28, Ohio.

39 FORMULAS, PLANS, ETC.

FORMULAS—Simple but high quality modern developments of all kinds of chem. & science. Our formulas are used by many of America's largest corporations. Write for free offer and proof. Burnside Chemicals Inc., 284 9th Ave., Brooklyn 15, N. Y.

SPECIAL Formulas for latest money-making discoveries. New Good Profitable Literature. Free. Miller Chemist 1317-N, Tampa, Florida.

FORMULAS—All Kinds—Moneymakers. There's a huge, Dame Kemico, Park Ridge 15, Illinois.

CLASS MODEL Models Using Formulas. List Free. Creative Service, Marieville, New York.

FREE Large Formula Catalog Anything Analyzed. Western Chemical, Salem, Oregon.

40

PLASTICS

NEW Liquid casting plastic clear color. Painted, red, Roberts, butterflies, photo, etc. Solid 25¢ or two hubcaps. How to Cast Liquid Plastic and How to Make Extra Money at Home. Catalog, Dept. B-102, Woodstock, Illinois.

PLASTIC Vacuum Forming Machine. Hobby Easy, Profitable. Burr, 230 East Centre, Kalamazoo, Mich.

PLASTICS for casting, molding, embedding and jewelry. Send 25c for catalog. Castcraft Corp., Dept. B-241, P. O. Box 545, Palo Alto, Calif.

PLEXIGLAS—Any thickness—Clear Colors Cut to size. Clear rods—Tubing. M. Curtis Plastics, P. O. Box 1548, Hanover, Penn., Alaska.

CELLULOID scrap, sheets, slate thickness, colors. Box 333, Kearny, New Jersey.

EVERYTHING in Plastic. Catalog 25c. Gel, Box 261, Union, N. J.

41 SCIENCE & CHEMISTRY

AMAZING New Book Of Science Experiments, Formulas and Catalogue of Laboratory Supplies. Only 25c. National Scientific Co., Dept. P-2, 12 S. Park Avenue, Lombard, Illinois.

MICROSCOPE slides, anatomical. Fresh fish. Bay 408 Roosevelt, San Francisco 14, California.

1000 AL Chemistry books, courses, kits! Rare chemicals, cheap. Catalog 25c. National, Box 133-A, Palo Alto, Calif.

232 PAGE Catalog \$2.00 Laboratory Materials. 7318 Vincennes, Chicago, Illinois.

BONNELL'S Chemistry, Electricity, Science, Aeronautics, Aviation, Phonics, "Mathematics," "Heat," Sound, "Geometry" 10c Each Franka, 3121 North Racine, Chicago 2.

SPECTACULAR Laboratory Supplies Catalogue \$1. Fair Worth Booklet, One, Dr. Warren Laboratories, Mantova, Wisc.

10 X KET Model Kits, parts, chemicals. Catalog, price 25c. Central Hobby Company, Waukesha, Wisc.

CHEMICALS and glassware for industrial plants, 4 and 5000 lab. laboratories. Catalog 25c. Dept. M-26, Biocultural Supply Co., 1-6-540, 110th Ave., Rochester 20, N. Y.

PREMIUMS A 1000 item Catalog 12c. 1000 ad. in one. 25c. R. C. Chemical Products, 30P Somerset, Belmont 78, Massachusetts.

111 STRATHI Catalog. Chemistry, biology, b. 1001, 201 Tracey Laboratories, Elgin, Illinois.

10 X KET Chemicals, Catalog 25c. Keefe Scientific, 159-10 Hillside Avenue, Jamaica, New York.

111-11410 Science catalog—25c. W. H. Chemists, 124 West 22, New York 11.

MICROSCOPES, Radios, Surveying, everything Japanese Catalog 25c. Miss. Instrument 2 E 46, New York 17.

CHEMISTRY catalog 25 cents. Used equipment, bargains! Laboratory Sales, Box 181-B, Brighton, Mass.

42 EMPLOYMENT INFORMATION

FOREIGN Jobs—Latin America, Alaska, Canada, up to \$1500 monthly. Up-to-date 1961 Foreign Service Directory gives complete information, hot list of firms hiring for Military and Civilian Construction. Arrangements in 100+ countries. Missing How-When-Where to apply. 13th Successful year. \$1.00 Global Reports, Box 383 P. O. Los Angeles 8, California.

HIGH PAY Overseas, Domestic Jobs. Men, Women. Generous Benefits. Companies Pay Transportation. For Info write World Wide, Dept. C. B., 140 N Franklin St., New York 13, N. Y.

CALIFORNIA Job Opportunities? Write Jim Smith, Box 4354-B, Los Angeles 55.

POPULAR SCIENCE OPPORTUNITIES

POSITION Employment Information. Work overseas Trans. adventure & cargo Africa Asia Canada Alaska East as much as \$1,000 Month's Commission been truck drivers &c. See less professionals, etc. Fabulous opportunities Most complete U.S. job as far as 1000 Alaska etc. Send by return mail same day received. Send \$2.00 to Dept. PS, Foreign Bureau P. O. Box 512, New Orleans, Louisiana.

JOBS High Pay Foreign countries USA. All trades. Write Dept. 55E, National Employment Information, 1009 Broad, Newark, N. J.

DIRECTORY Repair Contractors 800000 shopping & sales government bus. factor & trucking, etc. Forestale Statewide Hospital & medical plus 80 getting tips in preparing business letters. 1000 local news & bus. sources of information. Art Books. Oct. \$3.00 (\$2.25 Airmail) I.C.O.D.'s Accredited Research Services, Meramec Business 84 Louis 5-18 Memphis.

INDU Salaries—Petroleum Construction Manufacturers, Teachers, Etc. Technical Personnel & Personnel Travel paid living expenses in U.S.A., U.S. Tax Exempt. In addition \$2.25 off mailed to domestic opposite you. Aperado Artesiana, Mexico. Laredo, Texas.

HIGH Paying Foreign Jobs Far East Europe South America. Jobs on ship and civil service. For information, write to International Employment, P.O. Box 113 Boston 21 Mass.

OVERSEAS USA Jobs Guidebooks hundreds of listings. Australia \$2.00 Future, Dept. F, 210 West 34 Street, New York City 1.

WANT Civil Service Jobs Now Available. Handbook Tells How \$1.50 Prepaid. Moneyback Guarantee Edwards, 20 East Goethe, Chicago 10, Illinois.

JAPAN Far East Many foreign jobs available now. All types. Complete detailed reports \$2.00. Walts, Box 983 C.P.O. Tokyo.

WORK opportunities in various Areas Information and job lists \$1.00. Thru-Way Enterprises, Box 5661 Phoenix 2, Arizona.

43 AGENTS WANTED

BLEKING New Product! Get us out of 47 m. by mailing price & latest information for license at Head office. Just your name. Kresser St. Akron, Ohio.

YOUR Own business—Build It Up Complete \$50. Mail now \$15. \$100. \$25. Ladies Coats 10c. Dresses 15c. Friendship bracelets. Catalog Free. S. H. Johnson, 3100 3 Roosevelt Road, Chicago 8, Ill.

EASY Man & Present Reliable sales kit offer showing line by buckles, tie clamps, money clips, cuff links, lapels, ideal fashion gifts. Send us a list of customer's name and address. Use address for 100% bus. tax. \$1.50 down. Send money order or cashier's check. Mail back to us. \$1.00 per item. Blackfoot, Box 14257, Providence, R. I.

AMAZING Greeting Card Money-Makers! Make \$75.00 on 100 Deluxe \$1.25 Assortments. Newest Create-A-Card personal greetings for all occasions. 100 fast-sellers. Largest profits. Gift Bonuses. Experience unnecessary. Samples on approval. Exclusive \$1.25 Buren Salt-Pepper Card Free for promptness. Creative, 4401 Cermak, Dept. 512-V, Chicago 22.

START Making Money Now Earn top commissions taking orders for all magazine subscriptions. Friends and neighbors are your prospects. No experience needed. Write for free money-making kit. McGregor Magazine Agency, Dept. 114A, Mount Morris, Illinois.

ANYONE can be an Hoover Uni-forms for beauty school, hairdressers, nurses, doctors, others. Miracle fabrics Nylon, Denim, Wool, N Wear Cotton, Etc. Help starts top 1000. Help in the new line to a big profit. Free Hoover Dept. 5181 New York 12, N. Y.

MEN Women Adults Personalized men's blouses. Blouse & blouse personalized plus personalized hats & slacks. Complete line bra & girdles, jackets, etc. All may take orders. Order #40. Commission 10% down and 10% sales outfit free. Novello 3243 North Avenue, Chicago 47.

MONEY Making Opportunity! Take big per cent orders of world famous Patented Valentine Print Tree and Paper Bag Straws. Makes Vines Bag Boxes on the New Stock Book Desk 20211, Louisiana, Mississippi.

SELL Show off this amazing offer! Pat has national account & thousands of stores per 80. Make \$25. day up. For other's for free samples details write to Dept. C, 161 Lauderdale Card, Dept. 312T.

AGENTS \$300. profit selling genuine gold wedding letter & stores and others. Free samples. Metallic Sign Letter Co., 1217-E West Newport Chicago.

\$2.50 PER hour or more for part or full time home work. Large repeat orders. Man or Woman. Write McNees Co., Freeport 22K, Ill.

CALENDARA Advertising Materials. Mail Ads. Ad styles including. Mail Order Catalogs 12 sheets. Books Thousands of Advertising Materials Book Matches, etc. Printing Calendar Co., Promotional Division 6200 Cottage Grove, Chicago 37-111.

MAKE Extra \$2. Cash On 100 Boxes new Patented Charm all occasion greeting cards. Other money makers. Profit's to 100 plus bonus. Samples on approval. Free personalized gift with first order. Southern Greetings, 474 N. Hollywood, Dept. P-58, Memphis, Tennessee.

BLITZ Profit & stamp box ad. Send 100 Photo Key Pictures. Sample M-10. Selling Free General Products, 11 No Pearl St., Albany 1, N. Y.

RAVEN extra strength pads by one of the best known brands. Drug standards also. 100% reliable. Write for free catalog and details. Federal Pharmacy, Republic Blvd. 10P, 6632 N. Western, Chicago 48, Illinois.

NEW Car Thief Signal Lightning Seller. Send me sent on trial. Northwest Electric 314 W. Bell R. Oak.

PIREX Beautiful Mexican curios! Send 100 stamps mailing. Syltrial, Aperado 9340, Mexico City.

ATTRACTIVE Cigarette Lighters personalized and custom. Write Box 8-90 for sample. Your initial quantity prices. Hobson, P. O. Box 315 P. Forest Hills 75, N. Y.

WANTED Part Time Fire Extinguisher Salesmen. Out-O-Matic, 15370 East 81st Street, Cleveland.

High Money in your home household box. Box 33, Wantagh, New York.

MAKE Profitable Men's-Women's Wear Bulk. Fire. Handmade. Brocton 84. Massachussets.

BUSINESS of your own. Earnings potential as high as \$100,000 annually. Based on \$12,000 base. No investment to be made for free replacement basket. Marcelline 4-1070, Box 4-100, Louisville, Ky.

NATHAN T Dress & ladies' leather. Replaces messy bags, liquids. Simply glue over glass. Samples sent on trial. Kristin, 22, Akron, Ohio.

44 HIGH-GRADE SALESMEN

EARN Big Commissions Full Or Part Time. Build profitable business of your own selling America's largest line low priced business printing. 300 new catalog samples hundred of items used daily by business men. Imported by us. Low as \$2.25 for 100. Heavy discounts are included. Free catalog. National Press, Dept. 9, North Chicago 1-111.

MAKE Extra Money Selling advertising matchbooks. Free catalog and sales outlet. Matchcorp, Dept. PS-21, Chicago 22.

YOU get free copy of World's Biggest magazine tells you how and where to make more money on your own in selling. Write Specialty Salesman Magazine, Dept. SB, 307 North Michigan, Chicago 1.

MAKE Extra Money—Big Cash Commissions plus premiums for you and your customers. Self Advertising Book Matches. Catalog free. 100 items. Great variety. It is the largest manufacturer. All sizes. Quick daily sales. Big profit. Free. Free Master Kit makes selling easy—no experience necessary. Superior Match Dept. P-261, 7330 Greenwood, Chicago 12-11.

GIFT New Shirt Outfit. Free 100 week & no 2 size are made to your size. Suit is made to measure & dress and sport shirt at \$1.50 apiece and to all men. No order is required. Full or part time. Write Parks Brothers Co., Dept. 319, Terre Haute, Ind.

If you're interested in making money in selling see the hundreds of exceptional opportunities in **Entrepreneur's Opportunity Magazine**. Send name for your copy absolutely free. Tell us what you're looking for. Opportunity, 840 N. Dearborn, Dept. 10, Chicago 10, Illinois.

SELL send me free sample newest advancements in business since nation patented for health. Mail it over the house without cost, posters without cost. National, advertised price \$1.00. Make money introducing to friends at \$1.00 per American Mail, Dept. 343, Indianapolis 4, Ind.

KENNATIONAL new lower burning light bulb. Amazing Free Report. It goes after better again but not to burn. No competition. Multi million dollar market and above. Make great fortune even space time. Incredibly quick sales. Price sales kit. Merlin Club Div. 114 E. 32nd, Dept. C, 148, New York 16.

SELL You test new items in your home? Surprise me by my latest catalog, forces for home car. Send no money. Just your name. Kristen 104, Akron, Ohio.

\$1,000.00 A month for making dramatic 3 second demonstration of working model. Presto Fire Extinguisher. New chemical used by Airforce burns out fires instantly. Only \$4.95. Terrific commissions. Millions want it. Free Kit Merlin, 114 E. 32nd, Dept. P-88, New York 16.

WANTED Premium and Advertising Books for the non-conceptive. Volume. Books. Contact with Quantity Accounts is based on Imposta. Box 304, Wichita, Kansas.

.00 PROF T selling mechanics waterless hand cleaner. Repairs repairs and repairs. Part or full time. Free sample. M-100, Pittsburgh 2, Pa. Dept. PG-11.

45 EDUCATIONAL & INSTRUCTION

CIVIL Service Training for U.S. Test. Get full information about this field. Home study preparation for high rating. Free booklet. Private organization. No obligation. Franklin Institute, Dept. B-12, Rochester 4, N. Y.

LEARN White Ashes with your recorder, phonograph or standard new electronic recorder. Endless tape recorded. Details free. Research Association, Box 24-NN, Olympia, Washington.

HIGH School Diploma at home. Enclosed lessons. An accredited institution. Northern States Academy, Clinton 2-12, Atlanta 4, Ga.

MANUFACT Watchmaking at home. Free sample lesson. Chicago School, 2-125-WO. Webster, Chicago 47.

WANT a Diesel job. Higher Pay. All equipment. We can help you qualify. Cummins Diesel, Tractor and Steady Employment and Continuous Diesel Kits for those who had home training courses available. Write today. Industrial Training Service Dept. B-2, Pittsfield 12, Ore.

COMPLETE Your High School at home in one year with 43 sat. to school. Texts furnished. No classes. Diploma. Information booklet free. American School, Dept. X-244, Detroit, at both Chicago 37-111.

ENGINEERING and Art Degrees earned through home study. Electronics, Electrical, Mechanical, Civil, etc. Liberal Arts. When will you start course desired. The City International College of Arts & Sciences, 100 University, a correspondence school. Residential classes are not offered. 5100 S. Alvarado, Motion Boulevard, Los Angeles 12, Calif.

LEARN Accounting. Free catalog. Monroe, Akron, School, Box 944-X, Akron, Ohio. Major.

BECOME Tax Consultant. Graduates earn \$1,000-\$3,000 every tax season per permit returning evenings. State approved Union Institute, Lakewood 1W, N. J.

PLAN Turning Part. Big money in sports line. Learn at home in 30 days. No capital required. Necessary. Photo-graphic records. 100% satisfaction guaranteed. Turned out 100% taught. Free catalog Capital Turning School, 3100 S.W. 16th Court, Ft. Lauderdale, Fla.

GAME We are Government Hunter. Parks & Park and wild life service on foot. A volunteer job required. Salary not determined. Pay by pay scale. Complete information. Free. Write North American School of Conservation, Dept. 182B, 818 Dodsworth, Covina, Calif.

POPULAR SCIENCE OPPORTUNITIES

BE A Real Estate Broker. Insure Security for yourself and your family Study at home. Prepare for state examination. GI acquired. Write for Free Book Today. Weaver School of Real Estate, 3918 R Grand, Kansas City, Missouri.

LEARN Civil and criminal investigation at home. Earn steady, good pay. State Institute Applied Science, 1950 Bensenville, Dept. 232 Chicago 40, Illinois.

FREE LP Record and book gives instructive facts about Sleep-Education and the Audio Educator—the short cut method to learning and self-development. No obligation. SDRP Dept. G-2, 104 East 49th Street, New York 6, N. Y.

GOOD paying jobs open! Operate, repair heavy earth moving equipment! Learn "on the job" operating latest cranes, bulldozers, earth movers. V.A. Approved. Free Catalog. Write N.B. Hutch, Green Technical Institute, Braidwood, Illinois.

DRAFTING Pays Big Money . . . leads to top positions in automotive, aeronautical, construction, mechanical fields. Learn at home in spare time. All equipment supplied. Pay later plan. Free Book. Christ's Trade School, CD-301 104 Lawrence Ct., no 2.

USED Correspondence Courses and Books sold and rented. Money back guarantee. Catalog free. (Courses bought.) Lee Mountain, Playa, A. abella.

BOOKKEEPERS Operate Your Own 14 hr-a-week system. Eliza, Box 300, Cedar Grove, North Carolina.

LEARN how—pass civil service or education type tests with good scores. Many helpful suggestions. Satisfaction guaranteed. Mail \$1.00. Universal 134 Powell, San Francisco 2.

LEARN Expert Cake Decorating Cards Mckay, Free Details in Home Instruction Method Candy & Cake, Dept. 300, Fallbrook Calif.

PICKER General Catalog—100 Pages Test vocational educational interests at subjects. Millions of women now used. Bargain prices. Books bought. Est. 1902. Long & Collier Book Co., Dept. PG, Columbus 1, Ohio.

ANALYZE Handwriting for profit pleasure. Free sample lesson, catalog reveals plan. Write Jena, Inc. Dept. 2CM 1, Beloit 4, Wisconsin.

POPULAR piano self taught. Complete step-by-step Deluxe Method course \$5.00. Actually play the first week. D & M, 202 Bischoff St., Fond du Lac, Wisconsin.

OWN local collection office. Pays big. Franklin Credit, Roanoke, Virginia.

FINISH High School at home. No classes. Texts furnished. Diploma awarded if 17 or over and have left school write for Free Assignment and catalog. Wayne School, Dept. 243 WC, 618 S. Dearborn, Chicago 6, Ill.

WARMTH PROJECT in your Matthew is a Read Christ And The Sabbath. 20c. Jack Jensen, Box 4073, Riverside, California.

USED correspondence courses, sale or rent with purchase option. Send wantlist. (Courses bought). Edmar Wall, Byars, Oklahoma.

HELP-Study Courses Blueprint Reading, Schematic Wires, Drawing (Mechanical), Electronics, Architectural, Art). Send \$2.00 chapter or \$8.75 special main chapters. Louis D. Prior Inc., 22-38 186th St White Plains 37, N.Y.

INTERIOR Decoration. Approved supervised home study training to be start the point for career. No classes. Text and work kit furnished. Diploma awarded. Low tuition and payment. Send for free booklet. Chicago School of Interior Decoration, 435 Diversey Pkwy., Dept. 1722. Chicago 14, Ill.

OPP RATE Your Own Profitable Research Service. Copyright Manual Explains All. Free Literature. Ben Linda 21st and Walnut, Leavenworth, Kansas.

BOOKKEEPING Course Simplified \$2.95 Nationally Advertised, 11 Chapters. Illustrated. Practice Beta Business Household Accounts. H. M. and Mrs. Brown, 22A Pierrepont, Brooklyn 1, N.Y.

GRADUATE—Institutes abroad. Inexpensive courses, in a few months. Science of Psychology, Engineering, Aurene, Central Valley, New York.

VALUABLE British diplomas, hearing metaphysics. Prospectus free. Universal Currents three books. Lodge Brantbridge Forest, Balcombe, Sussex, England.

PENMANSHIP Corrector: Improve poor penmanship quickly. Details free. Omnia, Box 945 25, St. Louis, Mo.

MEMORIZING Amazingly Easy New Simple Method Produces Results Learned in 10 Minutes Back from after Page 100. Memory Course 300 North Street S.W., Cedar Rapids, Iowa.

LEARN Auto Upholstery body fender repair and painting at home in spare time. Cash in on 30 million cars needing body fender, upholstery services. Earn as you learn. Send for free facts on unique 3-in-1 Home Study Course. Modern Auto Institute, Dept. 190A, 4028 W Third St., Los Angeles 5, Calif.

LEARN Typewriter Repair at home in spare time. Cash in on 20 million typewriters needing repair or service. Earn as you learn. No special tools needed. Send for free facts on Home Study Course Modern Typewriter Repair Institute, Dept. T-200, 4028 W Third St., Los Angeles 5, Calif.

MEET wanted. Learn Auto-Diesel Mechanics in our shops. Learn with tools on real equipment. Earn While You Learn. Many of our graduates earn \$125 a week and up. Write for free bulletin. Auto-Diesel College, Dept. 262, Nashville 3, Tenn.

ACHIEVEMENT Guide—24 hour schedule diary, \$1.00 International Press, 380, Natural Rd., Inc., St. Louis 1, Mo.

LEARN Real Estate Business fast. From Social Economy. Particulars. Free Howard Schools, 322 Oliver, Kansas City 3, Missouri.

TOP Can start for Civil Service career through home study. Attractive salaries, benefits. Free booklet. No obligation. Private organization. Franklin Institute Dept. 2B-2, Webster 4, N.Y.

46 CONTESTS

WIN contest money. General Contest. You're given hundreds of tips. 100 different contests rules. Sample pages. See the 2nd General Contests, 1800-A East 9th Duluth 12, Minnesota.

MONTHLY Puzzle contests. Cash Prizes. Spend, Box 11549 St. Petersburg, Fla.

CONTENT Information. Latest Contests. Send Dime Guidelines, Box 244, Decorah, Iowa.

47 DETECTIVES

DETECTIVE Profession Home Study Badge. C.R. Books, Future, Box 41181-O, Los Angeles 41, California.

DETECTIVE Training. Phillips Secret Service, 810 Main, 1917-C North Kenneth, Cincinnati 10, Ohio.

DETECTIVES Work Home Travel Experience Supervisor Detective Partner free. Write Wagoner, P-123 West 88th, New York 24.

JOIN International Investigators Association Worldwide Member 1 p. Details free. Write Col. Hubley, 141 Bridge, Saint John, N.B., Canada.

DETECTIVES Undercover Operators Security Officers—we train Free Information. Write AMCAD Dept. A, 1001 Oak Street, Burlingame, California.

DETECTIVE Course Credentials. Diploma & Free Information. Southwestern Institute of Technology, 810 S. Iowa Street, Oklahoma City, Oklahoma.

48 LANGUAGE OUTFITS

LEARN world Interlanguage endorsed by UNESCO. Free lesson. Esperanto Middleham Way, Box 21.

50 BUSINESS SERVICE, INFORMATION, NAME LISTS

MAILING Lists—1000 names \$3.00. Your circulars mailed 1000—\$4.00. Free literature. Dixie Makers King, N.C.

52 AUTHORS SERVICE

WANT Your Book Published? Learn how we publish, advertise, promote, distribute. Mart Services. Free booklet PW Vantage 120 West 31, New York.

WRITERS'—Free sample copy of Pink Sheets. 31st top-notch markets of 11 "A" available to you upon request. Write today. Literary Agent Head, 215 Broadway, New York 10, N.Y.

GUIDE to Publishers \$1.00. 1800 So. 32 St. Omaha 4, Neb.

53 ADVERTISING, AGENCIES, ETC., FOR ADVERTISEES

FREE expert assistance for mailorder advertisers. Facebook leading newspapers, magazines, 10c. Chicago Advertising Agency, 24 E. Jackson, Chicago 4.

FREE! Red hot book. More Profit From Your Advertising. Little best Mail Order Magazine. Newspapers, Advertisers. 516A Cornelia, Chicago 11.

JUST Out! Amazing new booklet, "How to Make Money Through Classified Advertising." This booklet is must reading for ad men, order men. It tells you what, where, when and how to advertise. Contains scores of valuable hints on buying ads, writing copy, advertising results, etc. If you advertise now or ever plan to, don't fail to study this booklet. For your copy just send 10c to cover postage and handling to O.K. Kelly, Classified Adv. Man, Dept. 512 Popular Business 365 Lexington Ave, New York 17, N.Y.

ADVERTISE 24 words 100 Canadian Free papers \$5.50. Last Free Advertising Number, 10511 P. 300 Bedford, Cheshire 36.

54 CARTOONING, SIGN PAINTING, CHALK TALKS

HOW to Make Money With Home Cartoons. A book every one who likes to draw should have. It is free on application. Address: cartoonists Exchange Dept. 187 C Pleasant Hill, Ohio.

CARTOONERAMA Teaches you cartooning in a month. 24 Lesson Course. Free Brochure, C.P.A., Box 262W, Brantford, Connecticut.

LEARN Sign Painting Fast. Just the Right Skills. 446-P South Western, Springfield, Ohio.

20 LEARNERS in cartooning over 800 drawings. Cash Prizes for best drawings. Send for free details. Cartoonist B.L. P.O. Box 546, Dover, N.J.

If you can write, you can draw professional cartoons. Information: Alphabet Art, 133-3SPG 2nd, New Gardens 35, New York.

55 TYPEWRITERS & OFFICE MACHINES

TYPEWRITERS Monographs new, used. Five bats. Lee Johnson, Bunker, N.Y.

TYPEWRITERS, Printing, Duplicating Machines \$25.00 up. Write Dixie Graph, Knob, N.C.

56 RUBBER STAMPS & OFFICE SUPPLIES

FREE Rubber Stamp Catalog. Martins, 1425 Main Dr., Jefferson City, Missouri.

FREE Type Style & Price Chart. Free stock stamp literature. Standard Stamps \$2.50. Parts \$1.50 each. New Price Catalog. Labels, Decals, \$1.00. Youngers Stamp & Printing, Princeton, Iowa.

FREE One pocket rubber stamp self-inking \$1.00. L. Watson, P.O. Box 142, St. Charles, Illinois.

57 PRINTING, MULTIGRAPHING, ETC.

1,000 MICROGRAPH Cards. Printed letters, 4x6 to 2x4. Pioneer P.O. Island Park, New York.

FREE Catalog. Micrograph printing Rubber stamps. D.M. Press, Sebastopol, Calif.

OPPSET Printing—24 Hour Service— \$4.75—1000 8x2x11 \$10.50—5000. National Letter, 309 West 43rd St., New York City 30.

MIMICROGRAPHING Office Printing. Free samples. Pennewa, Dealer 1340, Bechtel, Pa.

350—8x2x11 HAMMERMILL Letterheads \$2.00. 250 Envelopes \$2.00. Samples. Davis, 7009 Bruce Road, Baltimore 22, Maryland. Samples.

1000 GUMMED Name & Address Labels \$1.00. Perky's, Essex, Mass.

1000 RAISED business cards \$2.75. Speedy service. Samples. Alto, Box 900, Neck, New York.

500 3x2x14 Four Line Stickers \$1.00. Red Border \$1.50. Morris, 312 Tuscola, Saginaw, Mich.

POPULAR SCIENCE OPPORTUNITIES

100 6x9 Envelopes, 100 5x8½ Letterheads printed, \$1.35. M. Portney, Box Dillaburn, Pa.

LETTERHEADS & Throats. Free surprise deal. Free Samples. Okayprint, Martins Ferry, Ohio.

LETTERHEADS, Circulars, etc. Price list sample, 25c. South 2nd, Phila. 10 Pa.

FREE Catalog postpaid printing. Mr. Donald, 546 North Oakland, Pasadena 4, California.

1000 ADDRESS Labels 35c. Three line pocket stamp 35c. Jordan's, 532 West O'Connor, Lima, Ohio.

58 PRINTING OUTFITS, SUPPLIES

PRINTING Outfits, type, supplies. Send name for illustrated supply book and samples. Kelsey Inc., R.R. 1, Marion, Ohio.

RUBBER Stamp Presses, Hydraulic Operated. Electrically heated. Sizes 5"x8" X 12", 10" x 14" or 12" x 16". Custom Printing Presses, Custom Manufacturer of 447 N Jefferson, Springfield 2, Missouri.

MAKE Your Own self-molding rubber stamps and printing casts. Flexirubber, Atwyle 3, Wisconsin.

NOW Do your own printing with your own Small Presses, prices from \$150. Complete selection of tools & accessories. Let us tell you. A. M. Type Founder, 633 Plymouth Church, S. L.

PRINTING Presses, Type Supplies, Tools &c. Turnbough Service, Mechanicsburg, Pa.

11 INCH Stamp Presses. "Inches" Kit in 2023 Harbor Road, Edgewater, N.J. 07020.

59 PATENT ATTORNEYS

SHREWD or Amaturish? Professional inventors use only Patent Attorneys appointed by Patent Office. Client. We bring names approved attorneys near you. Approved, Box 1780 Grand Central Station, New York 17, New York.

60 FOR INVENTORS

We have the markets if you have the ideas. Harvey Engineering, Cambridge 1, Mass. 02142.

INVENTIONS If you have an invention for sale, patented or unpatented, write Inventors of America, Dept. 10, 10A 235-P St., N.W., Washington 4, D.C.

INVENTIONS needed immediately for manufacturers. For additional information write Kessler Corporation, C-21, 21 Fremont Ohio.

INVENTORS! Why be broke? Turn your invention into cash. If saleable we can sell it. Write Universal Inventions, Box 294, Mayfield, Ohio.

INVENTORS Save time and money. Our complete "Patent Kit" makes it easy to prepare and file your own patent application free. Send a 10 cent stamp. National Inventors Service, Box 88, Ben Franklin Station, Washington, D.C.

INVENTOR A Creative Service. Cash Royalties. Sales. Inventors Researched. Patent Development Engineering. Free Information. Job Certificate. George Doctor, Ltd., 121 W. 42nd St., New York, New York Building, New York.

PATENT Searches including copies of nearest patents. \$6.00. Reports mailed within 48 hours. More than 200 registered patent attorneys have used my service. For free invention protection forms, write M-98 Ann Hastings, P.O. Box 178, Washington 4, D.C.

PATENTS Skillfully Prepared for maximum commercial value with useful product development. High record of success in proving and claiming patentability. Valuable market service. Patents prepared and filed for service fee as low as \$200.00. Send for self protecting invention record forms free. Patent search with valuable engineering report \$15.00. Foreign patents filed at lower cost. Thirty Years established. Joseph O'Brien, Patent & Development Engineer, 132 Hanover Street, New York 38, N.Y.

INVENTIONS wanted now by my Manufacturer Clients. Patented & Unpatented. Write Gilbert Adams Patent Broker, 20 Wall Street Financial District, New York City.

PATENT Searches including complete copies of related patents. \$6.00. Inventors at other than U.S. Patent Office may request.

W. G. White, Attorney & Patent Office of Inventor, 1400 Madison and Indiana, Los Angeles. Inventor Needs, 2011 Lee, Mississauga, Ontario, Canada, 1023 Vermont Avenue, N.W., Washington 3, D.C.

INVENTORS Need help preparing sketches of completing details of our invention? Send free technical and patent drawings prepared for inventors. Mail for ours and A.I. sets. Explain your problem in detail. Tel Pat. Ass'n. 5001 Dubuque Ave., Wash. 20, D.C.

YOU can now apply for patents. Send with complete project details to: Features For Sale, Demands or Method and A.I. 100c Free Registration Certificates. Patent Assistance, 100c. Complete wealth building instructions. 10c. Price by mail.

PATENTS Professionally Prepared for maximum commercial value. Patent Searches including report \$6.00. Patents prepared as low as \$235.00. Valuable market service with cash or royalty basis. 10 years dependable service. For free self-promoting record of invention forms write H. Lassner & Associates, Patent and Development Engineers, 10 Park Row, New York 20, N.Y.

PATENT Searches \$6.00 complete with comprehensive report and Office Patent Office record of record. \$1.00. Cash or Royalty basis. For free "Invention Protection Form" and "Patent Information," write U.S. Inventors Service Bureau, Headquarters Building, Washington 3, D.C.

INVENTORS! Consider our offer first before selling or licensing your invention on a cash or royalty basis. Patented. Unpatented. Write Inventors on Demand, 70 Wall Street, New York 3, N.Y.

INVENTIONS Wanted for immediate production. Patented, unpatented. Outright cash or royalty basis. Mills Building, Washington 3, D.C.

PROFESSIONAL Patent Searches \$1.00 complete with report and related patent copies. Complete patent and trademark services. Free forms. Write Congress International, Inc., Suite 210C McNamee Building, Washington 3, D.C.

PROTECTION with all patents or copy rights. Tekservice, 262 Woodlawn Station, North Bergen, N.J.

NEW Product Ideas Make Money in your free guide. Tell what's needed, develop, sell. Send \$1.00. Free protection form. Inventors Creative Service, P.O. 354, South Burling, Los Angeles 13, Calif.

CASH Or royalties for inventions. Patented. Unpatented. All types considered. International, 1170 Broadway, New York 1, N.Y.

QUALITY Patent Searches \$6.00. Copy of nearest patent or record of record. For personal letter, write American Patent Search Co., 422 Washington Blvd., Wash. 20, D.C.

SAME High Tech. \$1.00. Patent Kit. Now the "It's Youself" Patent Kit now makes it easy! Free Registration Form. Miss Suzanne Blaine, 306 Carry Rd., 2nd Floor, N.Y. 3, D.C.

PATENT searches including copies of nearest patent. \$6.00. Complete and properly administered. Free Protection Forms. Write Professional Patent Office Search Bureau, 700 A-beer Building, Washington 3, D.C.

INVENTOR A Creative Service. Patent of the year. \$1.00. Send the Patent Office Record of record and previous \$1.00. For free "Invention Protection Form" dependable service write Washington Patent Office Search Bureau, 1400 G Street, N.W., Washington 3, D.C.

Don't let high fees obtain U.S. Patents. Write for my free "Invention Protection Kit" with \$1.00. Free. See the Patent Office. Patent Office on 14th and 20th Sts., N.W., Washington 3, D.C.

INVENTORS Outright cash sale or royalties for your inventions. Patented. Unpatented. Constant demand from our client manufacturers. Write United States Invention Brokerage, 70 Wall Street, New York 3, N.Y.

61 INVENTIONS WANTED

INVENTORS Hundreds of manufacturers have requested our assistance in locating the latest new products. Complete information free. "Inventor of American Inventors," Dept. 30C 435-P Street, N.W., Washington 4, D.C.

ARE you interested in offers from reliable manufacturers for your invention? Patented, unpatented. Harvey Engineering, Cambridge, Maryland.

INVENTIONS wanted. Patented, unpatented. International Manufacturing Co., 2401 14th Street, N.W., Washington 2, D.C.

INVENTORS! Don't sell your invention, patented or unpatented, until you receive our offer. Write Universal Inventions, Box 294, Marion, Ohio.

INVENTIONS needed immediately for manufacturers. For additional information write Kessler Corporation, C-21-LW, Fremont, Ohio.

INVENTORS Complete Service. Last Inventories, New Inventions Researched. Patent Development. Free service. Free Inventor of the Year. One or two inventors. Licensed Inventor Kit. Write 3415 Woolworth Bldg., N.Y. 3, N.Y.

INVENTIONS Wanted. "Patented" - "Patent Pending" 30 Years experience Promoting Inventions. National Service Bureau, 3123 Meramec, St. Louis 18, Missouri.

INVENTORS! Consider our offer first before selling or licensing your invention on a cash or royalty basis. Patented. Unpatented. Write Inventions on Demand, 70 Wall Street, New York 3, N.Y.

CASH Or royalties for Inventorial Patents. Unpatented - All types considered. International, 1170 Broadway, New York 1, N.Y.

INVENTIONS Wanted for Invention promotion. Patented or unpatented. Outright cash or royalty basis. Case, 2416 Building, Washington 6, D.C.

INVENTIONS Outright cash sale or royalties for our clients. Patented. Unpatented. Constant demand from our client manufacturers. Write 3415 Woolworth Bldg., N.Y. 3, N.Y.

INVENTIONS wanted now by my Manufacturer Clients. Patented. Unpatented. Write Gilbert Adams Patent Broker, 20 Wall Street Financial District, New York 3, N.Y.

INVENTORS! Need a help with my problem. A small investment. Write me. I want to obtain a patent. Write the inventor of the year. One or two inventors. Write 3415 Woolworth Bldg., N.Y. 3, N.Y.

62 MANUFACTURING

FRESH Ideas in Toys. Leading toy manufacturer with national distribution and network TV show series. Write to: Mrs. Interested in pure toy only, whose end is to amuse and fascinate child. Not interested in craft-type items whose end goal is completion. Royalty and per item arrangements. Write for submission forms Colorforms, New Products Division, Norwood, New Jersey.

63 MODELS, MODEL SUPPLIES

SHIP Models. Most complete line in New England. Kits, fittings, plans, books, tools, engines, motors. Illustrated catalog 35c. James Bliss and Co., Inc., Dept. P-9, 342 Atlantic Avenue, Boston 10, Massachusetts.

SHIP Driven Models. No. 2000 illustrating many types motor driven & model autos, boats, displays, turntables, etc. Mail 25 cents cash, returnable first order \$2.00 or more. Wilson's of Cleveland Dept. PG, P.O. Box 3885, Ft. Lauderdale, Fla.

SHIP and yacht model fittings, blueprints. Send 40c for illustrated catalog listing hundreds of items. A. J. Fisher Inc., 1002-2 Etowah Ave., Royal Oak, Mich. 48204.

SHIP Model materials for building model homes and architectural buildings of sizes 1/16, 1/12, and 1/8 scale. Send 35c for catalog. A & B Model Builders, 664-P Donoran Road, Kansas City, Kansas.

SHIP Free Bargain Bulletins. Trains, Airplanes, Boats, Cars, Radio Control, Plastics. America's Hobby Center, 14478 West 22nd Street, New York 11, N.Y.

POPULAR SCIENCE OPPORTUNITIES

STOP Razor Burn—Guaranteed—\$1.00.
Razor P. O. Box 443 Portsmouth, Va.

RECEIVE samples, magazines, catalogs
opportunities, 10c. Starr, B-7092, San
Antonio 12, Texas

LISTS Manufacturers For Parts \$1.00.
Makowka, 242 S. Glenallen, Youngstown,
Ohio

CIGARETTES—Make 20 plain or Butter-
tip for 8c. Factory-Fresh pipe tobacco.
Parts from Moberly, Box #13, Owensboro,
Kentucky

MAKE Wines, Brandies, Cordials, Beer
Full Instructions. Trade Secrets \$1.00.
Horick Cincinnati 2d Ohio

CATHOLIC statuary books, Bibles—
tremendous savings Catholic House, Box
8488C Philadelphia, Penna.

80 PERSONAL

MEXICAN Legal Matters. A. Espejo,
Box 234-P, Hermosillo, Sonora, Mexico.

"MAKING Your Will", Two Will Forms
and simple "Instructions Guide", \$1.00
National, Box 48313H, Los Angeles 48,
Calif.

LORD'S Coming Very Near Get Proofs
Evangelism 283-PB, Duluth, Minnesota

PROPERTY Mapping our specialty Free
estimates. Write Deed-Elite, Mt. Pocono,
Penna.

ADULTS Only. Books Discussing Sex
Variations. Free List Welchel Limited,
Black Mountain, North Carolina

\$1000 IN savings tomorrow? \$1 tells
how. Phillips, 14016 Santa Teresa, Houston
45

RULE Others with your Thoughts.
Telepathy (Adults.) Write: Clarion, Box
8300-S6, Chicago 30

HAVE You Outgrown gods and super-
naturalism? Is all your concern for peo-
ple? Then you are a Humanist. Welcome
to American Humanist Association local
chapters publications. Send \$1 for 3
month trial membership (or \$5 for year)
to American Humanist Association, Dept
PSM Yellow Springs, Ohio.

ANCESTOR Hunting? Information For
Locating Them. \$1.00 Ronald Sinker
114 Plainfield Clarendon Hills Illinois

SUPER memory overnight! Success
guaranteed! Bijou, Box 1727-V, Hollywood
38 Calif.

'WHO Me?' Yes, you! Surprising facts
about how to be what you desire and set
what you want in life, sent you free Rush
request to: President, Box 1934-Q, Louis-
ville 1, Ky.

HOW To Cut Your Income Taxes Sim-
ple Easy Personal Tax Record Guide
\$1.00 Franklin Tax Management 14604
Estrella Avenue, La Mirada, California.

HEADACHE — Backache — Nervous —
Feet hurt — Can't sleep? Send for Our
Free Health Catalog and Enjoy The Com-
forts And Pleasure of Healthful Living
Peter's, 10000 Lamontier Ave., Cleveland
4, Ohio.

80A REMAILING SERVICE

SECRET Mail Address. \$3 Month Bed-
path, Box 439, Alhambra 24, California

WORLDWIDE Postmarks. Free Dollar
Coupon. VLA Associates, Box 2434S, Wash-
ington 13, D. C.

REMAILS 25c each \$3.00 monthly,
Bedwick 1114—30th St., Newport News,
Va.

80B LOANS BY MAIL

BORROW \$100 to \$500 by Mail Quick,
Easy. Private. No Co-Signers. Repay in
24 small monthly payments. For the
amount you want write today to Dial
Finance Co., 410 Kilpatrick Bldg., Dept
B-1 Omaha 2, Nebraska.

BORROW By Mail \$100-\$500 Any-
where Air Mail Service. Postal Finance,
200 Keeline Building, Department 11A,
Omaha 2 Nebraska.

CASH Loans by mail—anywhere—\$100-
\$1000 for 24 months. Write Security Fi-
nance Company, Dept. 1PB 544 Market
Street, San Francisco, California.

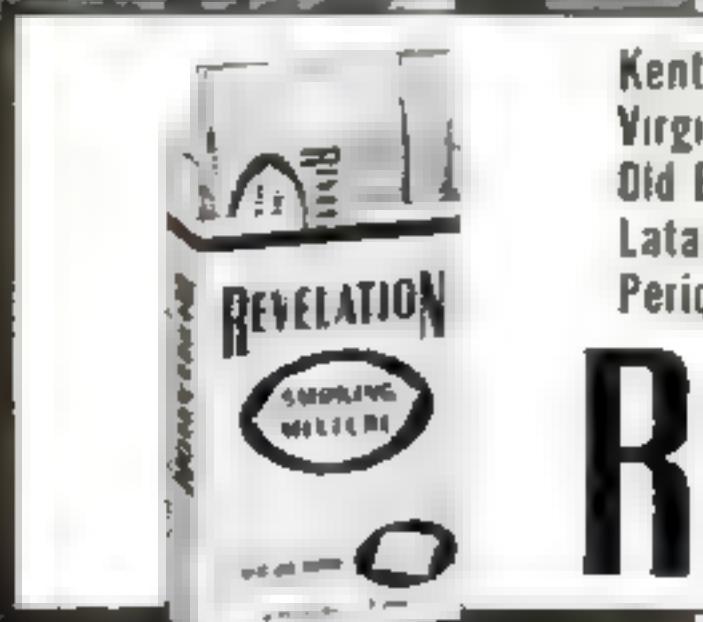
Can you
find
all five?

REVELATION USES
5 FINE TOBACCOS TO GIVE
YOU THAT SPECIAL TASTE

Each kind of tobacco has a
flavor personality, and Re-
velation uses 5 to bring out
the best in each. Try it soon
and get some new pleasure
in your pipe.

Kentucky Burley—dark flakes, slow burning
Virginia Bright—bright leaves, even burning
Old Belt Bright—slightly darker, good body
Latakia—deeper brown, extra mild
Perique—very dark, wonderful aroma

REVELATION
MILD SMOKING MIXTURE



DOUBLE-LENGTH FEATURE OF
TRUE SCIENCE ADVENTURE

The Violent and Mysterious End of Flight 2511

By Devon Francis

The Miami-bound airliner went down with 14 aboard and no survivors. Crash detectives pieced together a fantastic tale of terror in the sky—only to uncover a baffling new puzzle.



DOUBLE-LENGTH
FEATURE OF
TRUE SCIENCE
ADVENTURE



Captain of doomed plane: Dale H. Southard, 46. He had logged more than 16,000 hours' flying time as a pilot.

EARLY on a January morning, a year ago, an airliner crashed near the rural community of Bolivia, N. C., carrying 34 persons—everyone aboard—to their deaths.

At the time it seemed only a momen-

FLIGHT 2511, on that morning of January 6, had not been scheduled at all. Its passengers, along with 76 others, had been booked aboard a big jet transport from New York for Miami. Then a crack was discovered in a window on the jet. Putting in a new window would take eight hours.

The delayed and fretful passengers were marshaled aboard two other airplanes, neither having the jet's passenger capacity. One was an Electra turboprop, the other a DC-6B. Passengers boarded on a first-come, first-served basis. Seventy-six of them trooped into the Electra, the faster of the two planes. The remaining 29 took the DC-6—Flight 2511.

The DC-6 was a sturdy, trustworthy airplane, propelled by four 2,400-hp. piston engines. It cruised at a respectable 300 miles an hour at an altitude of $3\frac{1}{2}$ miles. It had a crew of five, captained by Dale H. Southard, 46, an old-timer who had logged 16,000 hours as a pilot. He had flown more than half of that in DC-6s.

The passengers were a typical cross section of northerners fleeing winter at the height of Florida's season. They ranged in age from 18, for Frederick Sweeting, a college student, to 68, for Vice Admiral Edward Orrick McDonnell, retired, proud possessor of a Congressional Medal of Honor.

Also listed on the passenger manifest was Carlos Ramos, a vice president of Havana's Continental Bank. Ramos had been ticketed on a Cuban airline to Havana, but had switched flights.

Not listed on Flight 2511's manifest were Murray G. Edwards of New York City and Mrs. Elizabeth Edwards. Though the Edwardses had been divorced, they wanted to ride to Miami together. They were the last in the long line of passengers who, shortly after 11 p.m., began filing into the Electra. Just ahead of them was a tall, blond man in his early thirties.

When the end of the line reached the mounting stairs, only two of the last three persons could be accommodated.

Edwards was relieved when the tall young man ahead of him stepped aside, saying, "It doesn't matter to me which airplane I take." That left room for both Edwardses in the Electra. The obliging young man who made room for them, a Westport, Conn., attorney named Julian Frank, boarded the DC-6.

The DC-6 had "dense" seating for economy-class passen-

*At takeoff the 34 persons had just 2 hours 45 $\frac{1}{2}$ minutes to live.
Except for one man—he had less.*



tarily puzzling accident that would soon yield its secret to the painstaking investigative procedures of the Civil Aeronautics Board.

In the next few months, however, it turned out to be one of the most mys-

terious and bizarre episodes in the annals of aviation. This is the story of the crash of National Airlines' Flight 2511—and of the patient scientific detective work that finally unraveled one mystery only to reveal another.

gers, with two seats in each row on the left of the aisle and three on the right, a total of 94. Thus each of the 29 passengers had the luxury of three seats to himself.

Capt. Southard studied the weather reports along his 1,125-mile route to Miami, filed his flight plan, and requested and was granted by Air Route Traffic Control a cruising altitude of 18,000 feet. He estimated his flight time at 4 hours, 45 minutes. This, because of anticipated head winds, was a few minutes slower than schedule time for a DC-6.

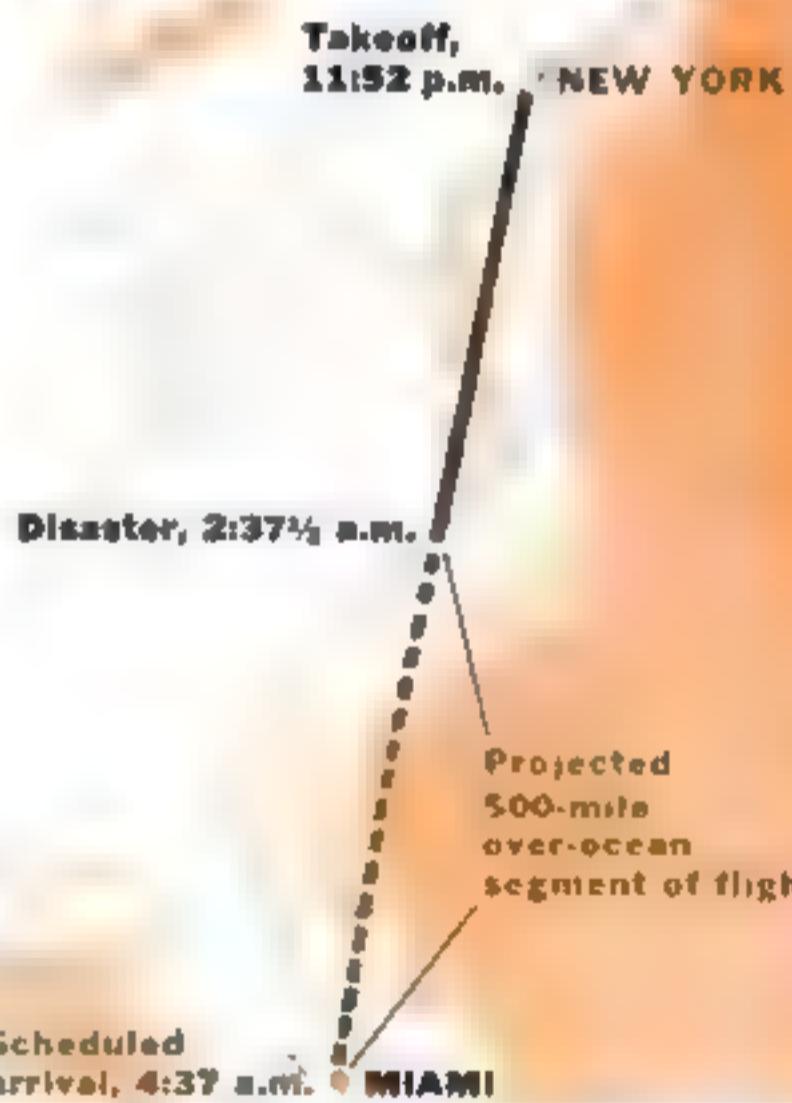
At 26 minutes to midnight the Electra, loaded first and cleared first, lifted off the runway into the night sky. It would land uneventfully in Miami about 3½ hours later.

At eight minutes to midnight Capt. Southard released the brakes on his DC-6 and pushed his four throttles to maximum takeoff power. He had 3,000 gallons of fuel aboard, enough for seven hours. Though the gross weight of the big aircraft thundering down the runway was more than 43 tons, it was still 6½ tons under its legal maximum.

At that moment, he and the 33 persons in his care had just 2 hours and 45½ minutes to live—except for one man. He had less.

CAPT. SOUTHDARD climbed out from New York and picked up Victor One, a U. S. airway bound south-southwest. Except for short stretches over Delaware and Chesapeake bays, the airplane would be over land until it was south of Wilmington, N. C. Following normal routine on flights having an over-water leg, the two stewardesses—both blue-eyed blondes—demonstrated to the passengers how to don and inflate their life vests.

As Flight 2511 progressed, the weather worsened. Im-



Intended route: Plane would be over land till south of Wilmington, N.C.



**DOUBLE-LENGTH
FEATURE OF
TRUE SCIENCE
ADVENTURE**



Close-up shows flight path in final minutes before plane went down 20 miles west of the Cape Fear River at 2:37½ a.m.

Wreckage was strewn over a wide area. Apparently the DC-6 had broken apart while still in the air.

mersed in clouds, Capt. Southard had to fly by instruments. Radio talk among pilots of other airliners on the airway reported carburetor icing and storm build-ups. Wind velocities were rising. Southbound planes fell behind their projected flight times.

Capt. Southard progressively radioed his position. At 33 minutes after takeoff, he was still climbing. At one a.m. he leveled off over Salisbury, Md., at his assigned altitude of 18,000 feet. At this height the interior of the plane was pressurized to the equivalent of 6,500 feet. This, though perfectly normal, meant that a pressure differential of 4.16 pounds per square inch was pushing outward on the fuselage shell.

Southard's ground speed up to now, 160 miles an hour, had been slowed both by the wind and the climb. By the time he reached Norfolk, Va., he had improved this to 218 miles an hour. Still, the wind was stronger than he had anticipated.

At 2:13 a.m. Flight 2511 reported that it was over Kinston, N. C., 75 miles short of Wilmington, and was estimating Wilmington at 2:30.

Capt. Sidney L. Oliver, at the controls of a northbound National plane, passed Flight 2511 between Wilmington and Kinston.

"For your information," he recognized the voice of his friend Southard say a moment later to Airway Traffic Control, "2511 broke out in the clear at Wilmington at 18,000." The plane, finally, was

above the clouds and rain.

"Roger," said ATC. "National 2511, contact Jacksonville Center over Drum." Drum was a check point over the Atlantic 63 miles beyond Wilmington.

"Okay," responded Southard, in obvious good humor.

At 2:27 a.m. Flight 2511, just south of Wilmington, reported to National's radio station there. Southard said he was estimating arrival over the Azalea intersection, another ocean check point 131 miles south-southwest of Wilmington, at 3:02. The radio transmission ended at 2:31.

From North Carolina's Cape Lookout to Palm Beach, Fla., the airway's landfall, the Atlantic coastline is a concave curve, a great scimitar, toothed and notched by islands, inlets, and bays. Below Wilmington, Capt. Southard's course took him over a sliver of a north-south inlet called the Cape Fear River.

On the east side of the inlet is a spit of land. Beyond lies the open Atlantic. The inlet is 20 miles long. Its lower reaches on the west side are marshy, tidewater flats.

At Cape Fear, Flight 2511 would start the long, over-ocean leg of the trip, a chord to the great semicircle described by the coastline.

It was now 2:33 a.m. At this instant a terrifying thing happened.

IN THE early-morning hours of January 6, Richard L. Randolph, a farmer living in a new house 1½ miles west of Bolivia and 20 miles west of the Cape Fear River, was awakened by his wife. She had heard a loud noise. Randolph himself heard something that sounded like two explosions. He went to the back door. Wind blew a soft rain in his face. He closed the door and went back to the bedroom and drew back a curtain.

His wife said, "I believe it's going to hit the house."

"No," he said, "ain't no plane going to hit the house."

He was uneasy, but he didn't want to frighten her. They were expecting a child.

Through the window he saw something burning. Then the flame faded. He did hear more noise; but the contractor who had built the house had left some loose tin out in back, and Randolph thought the noise sounded like the wind blowing the tin. He went back to bed.

At daybreak, about 6:30, Randolph sent his son, MacArthur, 14 years old, to his back field to feed the hogs. The boy returned wide-eyed and breathless. A big plane had crashed on the Randolph farm. Randolph ran out to take a look for himself.

Identifying the airline from the wreckage, he ran back to telephone National's office in Wilmington.

THE Civil Aeronautics Board immediately began the kind of investigation that has made its crash-detective work a model the world over. In charge was David L. Thompson, a sandy-haired, middle-aged ex-Navy pilot who flew down to the scene that morning. He and his staff of 10 tramped through the rubble, scattered over fields and woodland, with microphones in their lapels and miniature tape recorders in their pockets. It was faster to dictate than to take notes.

The plane had crashed only minutes after its last radio



Richard L. Randolph, Bolivia, N.C., farmer who reported the disaster by phone—and his son MacArthur, who first spotted the wreck.

General view of crash scene shows pathetic mass of rubble that was once a proud airplane. Impact was so severe that some of the engines were driven six feet into ground.



**DOUBLE-LENGTH
FEATURE OF
TRUE SCIENCE
ADVENTURE**

report—the clock on Capt. Southard's instrument panel had been smashed at 2:37½ a.m.

But it was a crash fitting no ordinary pattern. Most of the wreckage was scattered in bits and pieces over a three-quarter-mile area.

Seemingly the plane had broken into three huge pieces and countless smaller ones while still high in the air. The wreckage had fallen from a considerable height. Some of the engines had dug holes in the ground four to six feet deep.

The bodies of seven of the passengers were found clad in life jackets.

And 16 miles to the southeast by the marshes and beaches near the mouth of the Cape Fear inlet, there were reports of more wreckage that had fallen from the sky the night before.

Marine and National Guard troops, some of them skin divers, combed the inlet and a corridor from the inlet to the crash site for debris. Hall Watters, a local charter pilot, searched the inlet in a Piper Cub.

At Wilmington Airport, the investigators built a mock-up of the fuselage, of wood and chickenwire, and on it was hung what remained of the plane. That complicated the puzzle—a sizable section of the skin and fuselage structure on the right side, over the wing, was missing. The missing portion, constituting a fifth of the entire fuselage surface, was roughly triangular, running from the leading to the trailing edge of the right wing and extending upward beyond the parcel rack.

For a working hypothesis, investigators wondered if not one but two separate disasters could have overtaken the aircraft. One might have disabled it high over the Cape Fear inlet. Then Capt. Southard, struggling for control, might have reversed course and flown back for 16 miles before his broken plane disintegrated in the air.

But what could have been the cause?

Thompson methodically considered the possibilities:

- Metal fatigue, leading to explosive rupturing of the pressurized fuselage. But a study of the aluminum structural members showed no telltale, progressive rings, light in hue, that would indicate a gradual weakening of the metal.

- A broken prop blade knifing through the fuselage, followed by explosive decompression. But all 12 blades were found in place on their hubs.
- A failure of the cabin pressurization-relief valves. But the valves were found perfect.



The silence of death hovers over a portion of the wreckage as one of the plane's crew of five lies buried in twisted debris.



At Wilmington, CAB experts built mock-up and hung on it what remained of shattered fuselage.

● Collision with something in the air. But there were no paint smears, dents, or striations that would be left by an object heavy enough to inflict mortal wounds on so big a plane.

● A lightning stroke. No tiny pools of metal-melt, flash-heated—nor the characteristic pitting that would be distributed over wings and fuselage—were found.

● A fuel-vapor explosion. When fuel explodes, the wings—the containers—bulge, and seams are forced open. The metal stretches. That had not happened. Clean fractures showed that the damage to the wings had been caused when they hit the ground.

● An oxygen-bottle explosion. Planes like the DC-6 typically carry a few emergency tanks of compressed oxygen. But a break would give such a bottle a jet-propelled impulse of only 56 pounds, far too little to wreak the damage done.

● And finally, detonation of a "foreign" explosive brought inside the cabin. No evidence of that had been turned up.

The mystery deepened. Engines and propellers had been working normally right up to the instant of the airplane's final breakup. That was determined by standard procedures:

At cruising altitudes the DC-6 propellers turn at constant speed. Only their blade pitch changes. The propeller governor racks showed that the engines were developing a normal 1,000 horsepower, each at 2,200 r. p. m. when they hit the ground.

Propeller blade angles were examined. There are brass shims on blade shanks. On impact, a shoulder on the hub assembly almost always dents the shim plates. Since the shims are indexed to the blades, the blade angle at impact can be read off the dents with a special protractor. The blade angles had been at 50 degrees, in cruising range.

Three of the engines showed no fire damage. The two on the left had stayed with their wing all the way to the ground. The outboard engine on the right had torn free of its wing in the mid-air breakup. Two breaks had been made in the firewall of the inboard engine on the right wing. Fire had tongued through those holes and consumed most of the engine rear section behind the cam compartment. But the experienced crash detectives knew that this must have happened on the ground. If it had burned in the air, the slipstream would have brushed on horizontal soot patterns and melted-metal flowbacks.

None of the fuel tanks had caught fire.

Yet whatever had happened at 3½ miles above the Cape Fear River, the forces involved in the disaster had been savage.

Part of the fuselage had been torn as though by a mammoth, old-fashioned can opener. The tears were not the characteristic breaks caused by ground impact. Careful study showed that many of them had been made by some severed electrical cables. Whipped angrily by the plane's speed, the armored wires had sliced through fuselage structure and skin.



Detail photo shows interior of main cabin mock-up on right side, just forward of seat No. 7.



Parts of tail section are hoisted into position and tacked on by workmen during reconstruction.

DOUBLE LENGTH
FEATURE OF
TRUE SCIENCE
ADVENTURE



Three days after crash, Hall Watters—a local charter pilot flying a Piper Cub—spotted Frank's body as he flew over Snow's Marsh, 15 miles from main crash site.



The forward fuselage on the right side also bore 13 vertical, staggered cuts. These were jagged, like the edge of a piece of plywood run through a coarse-tooth table saw. Thus suggested that part of the fuselage had somehow swung into the right inboard prop. Fuselage paint on two of the three blades of this prop sustained that conclusion.

This had evidently occurred before final disintegration of the stricken plane, because the starboard engines had wrenched free of their wing at the very start of the breakup. In the wreckage plot of the Cape Bolivia area, they had been found back along the flight path, almost 4,000 feet from the port engines.

Now the bits and pieces of the puzzle began accumulating faster. Thirty-two of the 34 bodies had been found almost immediately. One of the two missing was that of Cuban banker Carlos Ramos; the other was that of young lawyer Julian Frank.

On Saturday, January 9, Pilot Watters in his Piper Cub located Frank's shattered body on Snow's Marsh, on the west side of the Cape Fear River, almost 15 air miles from the main crash site. It obviously had been catapulted from the aircraft. Watters also spotted a plane's three-seat unit.

On January 14, the body of Carlos Ramos was discovered at the site of the main wreckage.

Other debris that turned up at the inlet in the vicinity of Frank's body began to intrigue the investigators. There were remnants of a blue nylon passenger's flight bag that closed with a zipper. A life jacket had zipper teeth embedded in it, and was impregnated with blue nylon fibers. Other pieces of a blue flight bag were combed from the torn interior of the main wreckage.

Now all the resources of scientific research were marshaled. Hundreds of bits of metal, cloth, and human flesh were subjected to spectrographic, X-ray, microscopic, and chemical analysis. The laboratories engaged included those of the Federal Bureau of Investigation, New York City's chief medical examiner, the Armed Forces Institute of Pathology, and the Civil Air Surgeon's office.

A "human factors" group of 11 men was formed to evaluate the findings. Represented on it were the CAB, the Army, Navy, and Air Force, the Federal Aviation Agency, the Douglas Aircraft Co., National Airlines, Eastern Air Lines, and the Airline Pilots Association.

Chemical analysis showed that the life jacket found near Frank's body contained nitrate residues. Sodium carbonate,

sodium nitrate, and sodium sulfur compounds were found in one of the cabin air vents. Numerous small pieces of wire, less than 1/32 of an inch in diameter, were scattered in the fuselage opposite the point where structure and skin were missing. All of them had been "necked down" at the ends by tremendous tension.

Particles from a flight bag and traces of manganese dioxide had embedded themselves in the plane's carpeting.

The body of Julian Frank also began yielding clues.

The upholstery on the underside of seat No. 7—part of the unit found near Frank's body—was shredded, and the tubular framework distorted. An imprint on Frank's hips proved to be from the fabric pattern of seat No. 7.

Both of Frank's legs had been severed below the knees. The bones were shattered. The injury patterns of more than 1,400 persons who had fallen or jumped from airplanes were culled from the files of the Aerospace Pathology Branch of the Armed Forces Institute. All those bone breaks had been neat, as though made by a surgeon's saw. Nobody else on Flight 2511 had sustained injuries like Frank's.

A piece of brass was removed from Frank's left arm. Another piece of brass had adhered to one of his severed legs—found inside a piece of his trousers and lodged in a port-side parcel rack in the main wreckage. From Frank's right wrist some of the tiny, necked-down wires were removed by tweezers.

But it was on Frank's hands that laboratory interest focused.

Granular particles removed from his right hand were studied by spectroscope, an instrument that interprets materials by their color values. The particles looked like carbon black by diffused light and held a grayish sheen by reflected light. The hand also contained deposits of manganese dioxide. None of this was found in the body of any other passenger.

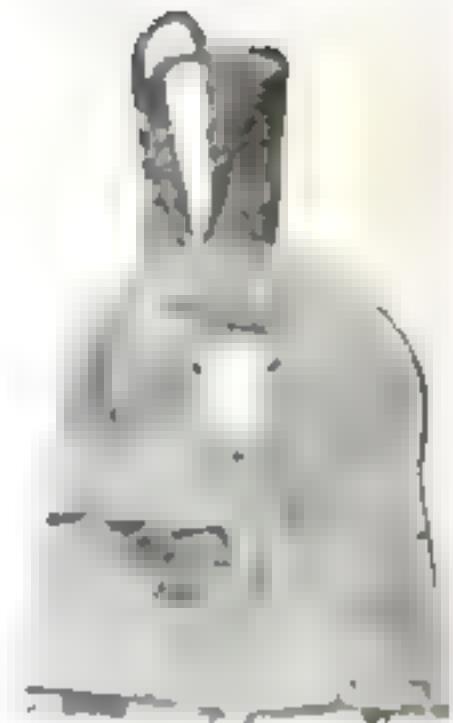
Some of the fingers of Frank's left hand were missing, and the wounds were ragged and shattered, like those on his legs.

The Civil Aeronautics Board called a formal hearing on the case of National Flight 2511 on March 22. It fitted together the fragments of evidence:

Sodium carbonate, sodium nitrate, and sodium-sulfur compounds ran the testimony—were typical residues of a dynamite explosion.

The tiny pieces of wire, necked down, were typical of what happens to wire used to bind together sticks of dynamite.

The manganese dioxide was from a dry-cell battery that apparently had been used to detonate the dynamite. This battery must have been carried aboard: While the plane



This life jacket, found at Kure Beach, 16 miles east of Bolivia, showed traces of nitrate, substantiating theory that an explosive was set off in the passenger cabin.



Plane's three-seat unit—recovered from Snow's Marsh near spot where Pilot Walters found Frank's body.

DOUBLE-LENGTH
FEATURE OF
TRUE SCIENCE
ADVENTURE

Was it suicide—or murder?



Had Julian Frank callously killed himself and 33 innocent people by exploding dynamite under seat No. 7? The evidence seemed to scale heavily toward that theory . . .



. . . But could he instead have been the victim of murder? Could an identical flight bag, containing dynamite and a time clock, have been switched for his own at Idlewild?

had its own emergency dry cells, all had been recovered.

The dispassionate eye of the laboratory technician was cast in the direction of the passenger Julian Frank.

"Do you find," Dr. Frederick W. Lovell of the Armed Forces Institute was asked at the hearing, "that the amputa-

SIX months and six days after Flight 2511 had fallen in pieces from the night sky, the CAB issued its report. Qualified cautiously, as always, it said: "The Board determines that the probable cause of this accident was the detonation of dynamite within the passenger cabin."

Who touched off the dynamite? That was not for the board to say. The malicious destruction of an aircraft is a federal crime, the FBI's province. For more than a year that agency has worked on the case, at times with as many as 100 agents.

But the CAB's crash detectives can now describe the events in the disaster with precision. The dynamite blast had torn out a big triangle of structure and skin, just above the right wing root. The pressurized cabin air swirled out like a tornado, and the thin, bitter-cold outside air filled the plane. The airliner's nose pitched downward. It began a great circle to the right, descending at thousands of feet a minute, far beyond its design limits. Severed cables flailed at the torn fuselage. Some of the terrified passengers snatched at life jackets.

For perhaps three minutes the plane plunged at its steep, curving glide through the clouds, its speed building higher and higher. Sixteen miles from the point of explosion, the tortured right wing broke off, the fuselage shattered, and Flight 2511 fell in fragments to the ground. A fire bloomed and crackled. Then it went out, and darkness and silence enveloped the rain-soaked mass grave.

What human hand had rent Flight 2511 asunder?

Julian Andrew Frank, 33, the tall young man who had given up his seat in the Electra so that the Edwardses could ride to Miami together, was known to have carried a blue, zippered flight bag aboard Flight 2511. Exceptionally heavy for a small bag, it had weighed 20 pounds at National's check-in counter.

Newspapers began fitting additional pieces into the jigsaw puzzle. Less than a year before, Frank had taken out more than \$1,000,000 in life-insurance and accident policies.

The skein of Frank's business activities was tangled and dark. Suit had been filed against him charging misappropriation of \$20,000. A district attorney had received a complaint that Frank had failed to account for money turned over to him as an advance on a fee. Still another attorney said Frank had asked him to represent him in disbarment proceedings.

Had Julian Frank killed himself and 33 others by exploding dynamite under seat No. 7? The evidence that scaled so heavily toward that theory had its counterweights:

- Close friends agreed that while Frank was moody and unpredictable, he was not suicidal.
- Frank's insurance policies contained the usual suicide

This One



D7X9-N3W-UUS9

tions in this case were caused by an explosive blast?"

"Yes, sir," said the witness.

The piece of brass removed from Frank's left arm was like that from a clip-type dry battery. The piece from his leg had formed the front retainer plate of a travel alarm clock.

clause. As a lawyer, he would have known well that if suicide occurred—and was identified—so soon after the policies were written, the money would not be paid. (At this time, it has still not been paid—pending final settlement in the courts.)

- An unsigned insurance application for an additional \$200,000 was found among Frank's papers.

- Frank had rejected a double-indemnity provision, in case of accidental death, on part of his insurance.

- If suicide-bent, why did Frank bother to buy a round-trip ticket, or plan a trip to Argentina within a week?

Or could all of this have been only a shrewd "cover" for a shockingly callous crime? Had Julian Frank, at 2:33 on that stormy night, believed that Flight 2511 was so far out over the ocean that its fragments could never be recovered and analyzed?

Or could Julian Frank have been murdered? Could an identical flight bag, containing the dynamite and a time clock, have been switched for his own in the confusion at the airport by someone intent on destroying him?

These are not questions that can be answered by spectroscope and X-ray. Some light can be cast on them, however, by circumstantial speculation:

1. At 2:33 the original jet flight, had it not been canceled, would already have been on the ground in Miami for half an hour. So the clock in that blue flight bag must have been set after it became known that Frank would take one or the other of the substitute planes.

2. At 2:33 the substitute Electra flight was off the mid-coast Florida shore, almost 50 miles from land, where the ocean depths were 1,400 feet.

3. At 2:33 the substitute DC-6 flight would also have been out over the Atlantic—if it had not been slowed by head winds.

If someone else had set the clock and planted it on Frank, the murderer would have had to be at the airport—to know that the jet flight was canceled, to make hasty calculations on the differing flight times of the Electra and the DC-6, and to reset the clock before substituting the bag.

But if Frank himself set the clock, wouldn't he have known that the plane was not yet out over the Atlantic at 2:33? Not necessarily. A passenger flying at 18,000 feet at night over layered undercast could not know whether the plane was over land or ocean.

But why a clock? A bomb in the hands of the bomber needs no timing mechanism. A simple switch will do.

Or, considering the terrible anxieties of a suicide aboard an airliner, would a man determined to kill himself have calculated that it would be surer if he did not leave the agonizing final decision to human will?



In 1955, Julian Andrew Frank, young Westport, Conn., attorney, married a pretty model named Janet Wagner. No hint of tragedy marred their wedding portrait.

ARE YOU TOO OLD TO LEARN?

not at all, scientists say

New tests show that: your ability to think increases with age; your powers of deduction are greater; your judgment is better.

In the I.C.S. files are thousands of cases of men and women of every age. Their successes, their promotions, their raises prove that men and women past school age can learn!

I.C.S. GIVES YOU EXPERT GUIDANCE FREE! Do you have the feeling you're "stuck" in your job? Your trained I.C.S. counselor will appraise your abilities, help you plan for the future.

IT'S NEVER TOO LATE TO GET STARTED! You study with I.C.S. at home, in your spare time. There's no interference with business or social activity. Famous I.C.S. texts make learning easy. Don't delay. Pick your field from the coupon below. And mail it today!

3 FREE BOOKS

16-page, pocket-size guide to advancement, a gold mine of tips on "How to Succeed." Big catalog outlining opportunities in your field of interest. Also sample lesson (Mathematics).



"I tried studying my work on my own, but I never got the good out of it that came from my I.C.S. Course. My salary has been increased 73.3%!"
E.L.B., Ohio

"I am president of a small corporation. A year ago I enrolled with I.C.S. as the most practical means available to me to learn what I needed."

W.J.A.
Michigan



"It's been so long since I went to school, I've forgotten much. But now that I'm taking an I.C.S. Course, I have confidence in my ability again."

H.A.R.
New Jersey



Actual statements.
Posed by models.

For Real Job Security—Get an I.C.S. Diploma! I.C.S., Scranton 15, Penna.

Accredited Member,
National Home Study Council



INTERNATIONAL CORRESPONDENCE SCHOOLS

BOX 99055, SCRANTON 15, PENNA.

(On Hawaii, reply P.O. Box 418, Honolulu)

(Partial list of courses)

ARCHITECTURE and BUILDING CONSTRUCTION

- Air Conditioning
- Architecture
- Arch. Drawing and Designing
- Building Contractor
- Building Estimator
- Carpenter Builder
- Carpentry and Millwork
- Heating
- Painting Contractor
- Plumbing
- Reading Arch. Blueprints

ART

- Commercial Art
- Magazine Illus.
- Sign Painting and Designing
- Sketching and Painting

AUTOMOTIVE

- Automobile
- Auto Body Rebuilding and Refinishing
- Auto Engine Tuneup
- Auto Electrical Technician
- Diesel Engines

AVIATION

- Aero-Engineering Technology
- Aviation Engine Mech.
- Reading Aircraft Blueprints

BUSINESS

- Accounting
- Advertising
- Bookkeeping and Cost Accounting
- Business Administration
- Business Management
- Clerk Typist
- Creative Salesmanship
- Managing a Small Business
- Professional Secretary
- Public Accounting
- Purchasing Agent
- Real Estate Salesmanship
- Salesmanship
- Salesmanship and Management
- Traffic Management

CHEMICAL

- Analytical Chemistry
- Chemical Engineering
- Chem. Lab. Technician
- General Chemistry

CEMETRIAL TECHNOLOGY

- Oil Field Technology
- Pulp and Paper Making

CIVIL ENGINEERING

- Civil Engineering
- Construction Engineering
- Highway Engineering
- Professional Engineer (Civil)
- Reading Struct. Blueprints
- Sanitary Engineer
- Sewage Plant Operator
- Structural Engineering
- Surveying and Mapping
- Water Works Operator

DRAFTING

- Aircraft Drafting
- Architectural Drafting
- Drafting & Machine Design
- Electrical Drafting
- Electrical Engineer Drafting
- Industrial Piping Drafting
- Mechanical Drafting
- Sheet Metal Drafting

ELECTRICAL

- Electrical Appliance Servicing
- Electrical Engineering

HIGH SCHOOL

- Good English
- High School Diploma
- High School General
- H. S. College Prep. (Eng'g & Science)
- High School Math
- High School Science
- Short Story Writing

LEADERSHIP

- Industrial Foremanship
- Industrial Supervision
- Personnel-Labor Relations
- Supervision

MECHANICAL and SHOP

- Diesel Engines
- Gas-Elec. Welding
- Heating and Air Conditioning
- Industrial Engineering
- Industrial Instrumentation

INDUSTRIAL SAFETY

- Machine Shop Practice
- Mechanical Engineering
- Plumbing and Heating
- Professional Engineer
- Quality Control
- Reading Shop Blueprints
- Refrigeration and Air Conditioning
- Tool Design
- Tool Making

RADIO, TELEVISION

- General Electronics Tech.

- Industrial Electronics

- Practical Radio-TV Eng'g

- Radio-TV Servicing

- TV Technician

RAILROAD

- General Railroad

STEAM and DIESEL POWER

- Combustion Engineering
- Power Plant Engineer
- Stationary Diesel Engr.
- Stationary Steam Engr.

TEXTILE

- General

Name _____

Age _____

Home Address _____

City _____

Zone _____

State _____

Working Hours _____

A.M. to P.M. _____

Canadian residents send coupon to International Correspondence Schools, Canadian, Ltd., Montreal, Canada. Special low monthly tuition rates to members of the U. S. Armed Forces.

Choose from Nat KING COLE, Frank SINATRA, The KINGSTON TRIO, Dinah SHORE, Ernie



TAKE 4-PAY

When you become a Trial Member of the Capitol Record Club, you can buy as few as six future record selections during the next 12 months.



187. NAT KING COLE. Timeless love songs in his intimate, warm style. Hear: *The More I See You*, *For All We Know*, *I Wish I Knew*, & more. \$4.98



202. STAN KENTON. Twelve stirring themes by Stan and his ablest arranger, Pete Rugolo: *Minor Rift*, *The End Of The World*, *Elegy For Alice*, plus 12 more. \$3.98



148. GIBBELLIS. Original Broadway cast of the smash hit. Entire show including *Paisley and Poker*, *The Name's In Guardia*, plus 12 more. \$3.98



1. GERSHWIN. His most famous works—*Rhapsody in Blue* and *An American in Paris*. Leonard Pennario with the Hollywood Bowl Symphony. \$4.98



183. JACKIE GLEASON. Plush interpretations of favorites *The Man I Love*, *Out Of Nowhere*, *Sophomore Song*, *But Not For Me*—12 more. \$4.98



48. OKLAHOMA! sound track. *Musical and Me*, *I Can't Say With The Best*, many more. \$4.98



203. TENNESSEE ERNIE FORD and the Jordanelles. In fervent, soul inspiring songs of faith. *No Tears In Heaven*, *When I Reach That City*, 10 more. \$3.98



13. PAL JOEY. Frank Sinatra belts them out from the movie sound track. *The Lady Is A Tramp*, *Be-Witched*, and other greats. (Monaural Only) \$4.98



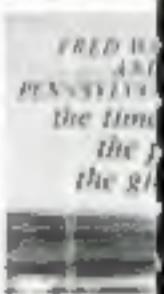
205. LEOPOLD STOKOWSKI. The music of Back Stage, brilliantly transcribed and conducted by the maestro. *Hooray, Horrible, Hooray*, *3 other works*. \$4.98



191. KISS ME KATE. Original Broadway production. Alfred Drake and Patricia Morrison sing *Wunderbar*, *In Love*, *Fee Dear Hay*, many more hits. \$3.98



194. DAKOTA STATON. Here's "blues" that's the "real"—to say the least! *Love Walked In*, *It's You Or No One*, 10 more. \$3.98



196. FRED WISE. The Grand Canyon Suite and Mississippi Suite, brilliantly performed by Felix Bloch and the Hollywood Bowl Symphony. \$4.98



88. ANNIE GET YOUR GUN. Original TV cast: Mary Martin, John Raitt, Doris Day, *What Comes Naturally*, *The Girl That I Marry*, etc. (Monaural Only) \$4.98



208. JONAH JONES. Skipper Jones' swingin' musical junket includes parts of cult film *Romeo Is Shango*, *Arrivederci Roma*, *Brazil*, 10 more. \$3.98



191. DINAH SHORE. Dinah's even more appealing in this album arranged and conducted by Andre Previn. *Remember*, *All Alone*, 10 more. \$3.98



192. CAROUSEL. Movie sound track, with Gordon MacRae and Shirley Jones. They sing *If I Loved You*, *Music Never Knows*, *You'll Never Walk Alone*, others. \$4.98



198. RED NICHOLS. "RED" and the Five Pennies serve a musical menu in Dixieland. *Meet Jo-De*, *September Song*, *Rollin' The Jack*—11 others. \$3.98



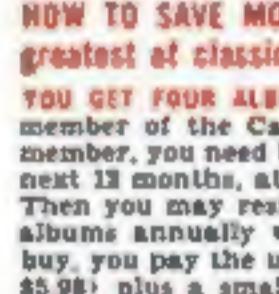
206. ROGER WAGNER CHORALE. He conducts his Chorale, Capitol Symphony in great religious music: *Bach's Passion Of St. John*, 9 more. \$4.98



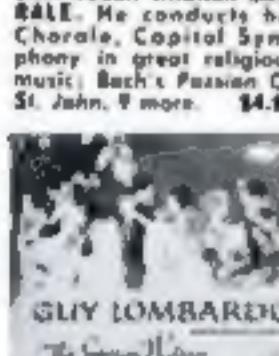
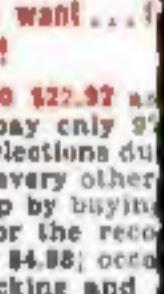
138. RAY ANTHONY. Ray and the orchestra at their lighthearted, danceable best. They play *Dancing Over the Waves*, *Intermezzo*, others. \$3.98



189. THE FOUR FRESHMEN AND FIVE GUITARS. Ever fresh young quartet with imaginative and musical ideas amplified by five guitars! *The More I See You*, 11 more. \$3.98



193. CAROUSEL. Movie sound track, with Gordon MacRae and Shirley Jones. They sing *If I Loved You*, *Music Never Knows*, *You'll Never Walk Alone*, others. \$4.98



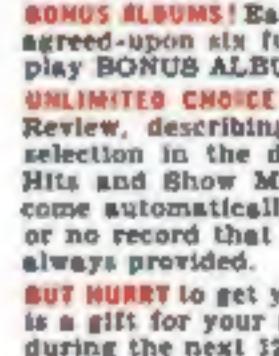
192. GUY LOMBARDO. The master of melody plays beloved favorites in three-quarter time: *Beautiful Ohio*, *Alice Blue Gown*, 10 other waltzes. \$3.98



97. THE MUSIC MAN. Original Cast Album, recorded in Capitol's "big sound". 17 big numbers including *Seventy-Six Trombones*, *It's You*. \$3.98



199. THE KINGSTON TRIO. Here are the boys again with guitars, banjos and bongos going like crazy: *How About Aliki Bee*, 11 more. \$3.98



200. JUNE CHRISTY. June's greatest hits from her days with Stan Kenton: *How High The Moon*, *Come Rain Or Come Shine*, 9 others. \$3.98

NOW TO SAVE MONEY on the Albums you want... greatest of classics is the biggest of hits!

YOU GET FOUR ALBUMS—RETAIL VALUE UP TO \$22.92 as member of the Capitol Record Club, and pay only 9% member, you need buy as few as six future selections during the next 12 months, at the rate of at least one every other month. Then you may resign, or retain membership by buying albums annually with full bonus credit. For the records you buy, you pay the usual retail price (\$3.98 or \$4.98) **plus** \$5.98 plus a small charge for postage, packing and handling.

BONUS ALBUMS! Each time you buy two more records at agreed-upon six future selections, you may choose a 12th album from a list of current Capitol releases.

UNLIMITED CHOICE! Each month you receive the Record Review, describing the month's selections. If you wish to change selection in the division you joined (Classical... Big Band... Show Music... or Hi-Fi Jazz), do nothing and come automatically. If you wish any of the other selections or no record that month—simply notify the Club on the 15th day of each month.

BUT HURRY! To get your FOUR ALBUMS—and pay only 9% member—**send now** for your agreement to buy 6 selections from the list of current Capitol releases during the next 12 months. The other three are Bonus albums which will be earned when you buy your second, fourth, sixth additional albums (at the rate of at least one every month), but which are given to you in advance.

SEND NO MONEY—RISK NOTHING! If not delighted, return four albums within 7 days and your membership charges will be cancelled without further obligation. Mail paid reply card to: Capitol Record Club, Dept. 5160, Box 5160, Philadelphia 3, Pennsylvania.



Model 100 $\frac{1}{2}$ h.p. Router illustrated

WOODWORKING MAGIC-AT 20,000 RPM *Porter-Cable Precision Router*

Here's the tool you need to make professional dovetail joints, dadoes, decorative edges, ornamental mouldings, intricate inlays, fine wood joints and hundreds of other woodworking jobs. Porter-Cable routers operate at 20,000 RPM with plenty of power to give you clean, smooth cuts every time. Try this versatile tool at your Porter-Cable dealer and discover the woodworking magic you have in your own hands.

Write for illustrated folder and name of your nearest Porter-Cable dealer.

PORTER-CABLE MACHINE COMPANY 1152 Marcellus St.
Syracuse, New York

SAWS • DRILLS • SANDERS • ROUTERS • SHAPERS • PLANES

In Canada: Porter-Cable Ltd., Box 817, Kingston, Ontario. Canadian prices slightly higher.

LIMITED OFFER!
\$9.95 ROUTER
BIT SET **FREE**

Get this basic selection of high speed steel bits with your purchase! Straight bit, corner round bit, rabbeting bit and sharpening wheel are packed in handy transparent plastic case.

